EFFICACY OF DEVELOPED AUDIO-VISUAL AID ON SMART HOMES TECHNOLOGY AMONG WORKING WOMEN

APRIL 2025 **TASNEEM KAPASI**

EFFICACY OF DEVELOPED AUDIO-VISUAL AID ON SMART HOMES TECHNOLOGY AMONG WORKING WOMEN

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Ethical Compliance Certificate 2024-2025

This is to certify Ms. Tasneem Kapasi study titled; "Efficacy of developed Audio-Visual aid on Smart Homes technology among Working Women." from Department of Family and Community Resource Management has been approved by the Institutional Ethics Committee for Human Research (IECHR), Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda. The study has been allotted the ethical approval number IECHR/FCSc/M.Sc./10/2024/27.

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CERTIFICATE

This is to certify that the thesis entitled **" EFFICACY OF DEVELOPED AUDIO-VISUAL AID ON SMART HOMES TECHNOLOGY AMONG WORKING WOMEN"** submitted for partial fulfilment of the requirement for the degree of Masters in the Faculty of Family and Community Sciences (Family and Community Resource Management) to the Maharaja Sayajirao University of Baroda, carried out by Ms. Tasneem Kapasi, is her original Bonafide work, to the best of my knowledge.

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INTRODUCTION

CHAPTER I

INTRODUCTION

In today's fast-paced world, we are constantly trying to balance work, social life, and financial responsibilities, all while packing more into our busy days. Managing energy efficiency in our homes or businesses using outdated and complex manual systems often requires specialized facilities management expertise adds another layer of stress. This challenge has sparked significant interest and media attention in Smart Home technologies, which promise to streamline these tasks and help create more efficient, responsive living and working environments (Bradfield, 2018).

Smart homes are a part of ubiquitous computing, where technology is integrated into homes to make daily life more convenient, safe, and efficient. Advancements in smart home technologies have transformed traditional homes into intelligent, internet-connected living spaces. An early definition of smart homes was provided by Lutolf. In 1992 Lutolf define “The smart home concept is the integration of different services within a home by using a common communication system. It assures an economic, secure, and comfortable operation of the home and includes a high degree of intelligent functionality and flexibility.”

These homes are designed to enhance comfort, healthcare, security, and energy conservation. A key feature of smart homes is remote monitoring systems, which use internet and communication technologies to allow homeowners to control various aspects of their home from a distance. Smart homes are designed to improve everyday life by automating household tasks and providing assistive services [(1)]. They enhance comfort by adjusting settings based on the home's environment and user preferences. With remote control features, homeowners can manage appliances and devices from anywhere, allowing them to complete tasks before they even step through the door. Few smart home systems also help save electricity by intelligently monitoring and optimizing energy use. In addition, these homes go beyond traditional security measures by using advanced monitoring and access control for better safety and peace of mind (Alam et. al., 2012).

The term "Smart Home" has been commonly used to refer the houses equipped with automated energy management systems. These systems help homeowners manage their

energy use more efficiently, making daily life easier compared to traditional homes without automation [(2)]. Smart home technology is particularly beneficial for elderly and people with disabilities, as it provides greater convenience, accessibility, and support for independent living (Guo et. al., 2019).

In recent years, the definition of a smart home has expanded beyond just energy control. Today, it encompasses a wide range of advanced technologies that work together in a single space. From automated lighting and climate control to security systems, voice assistants, and remote appliance management, smart homes now integrate multiple innovations to create a seamless, comfortable, and more efficient living environment. These homes not only enhance convenience but also contribute to energy conservation, safety, and overall well-being for their residents (Azab,2021).

A smart home is no longer just a place to live, it is an environment enhanced by technology to improve convenience, security, and efficiency. These modern homes are equipped with various smart features, including sensors that detect changes in the environment, wired and wireless networks that enable seamless communication between devices, and actuators that automate household functions. Intelligent systems further enhance the experience by learning user preferences, optimizing energy use, and providing remote control options, making daily life more convenient and efficient (Xiao Guo, 2019).

A smart home requires three essential components to function effectively:

I. Internal Network – This can be wired, wireless, or a combination of both, ensuring seamless communication between smart devices.
II. Intelligent Control – A central gateway or hub that manages and coordinates various systems, allowing them to work together efficiently.
III. Home Automation – A collection of smart devices, appliances, and systems that automate tasks within the home while also connecting to external services for enhanced functionality.

Together, these elements create a fully integrated and responsive living environment, making homes more convenient, efficient, and intelligent (Alam et. al., 2012).

1.1 The Role of Smart Home Technology in Safety, Health, and Comfort

I. **Health-** One of the main goals of smart home research is to make daily life easier and more comfortable. This is achieved by identifying human activities and automating tasks within the home, like adjusting lights and temperature based on your routines. Additionally, Smart Homes allow for remote management, so you can control appliances from anywhere using your smartphone. Many projects aim to analyse user behaviour to enhance energy efficiency by automatically switching off unused devices. Ultimately, Smart Home Technology aims to enhance convenience while being energy-efficient (Alam et. al., 2012).

II. **Comfort and convenience-** Smart home technology (SHT) greatly enhances comfort and convenience in our daily lives by automating routine tasks and allowing for seamless control of our living environments. For instance, smart thermostats can learn your schedule and adjust the temperature to ensure your home is always comfortable when you arrive. Smart lighting systems can be programmed to turn on or off based on your preferences or respond to voice commands, creating the perfect ambiance effortlessly. Additionally, with remote management capabilities, you can control appliances from anywhere using your smartphone, providing peace of mind and flexibility. This integration of devices allows for a more enjoyable and stress-free living experience, tailored to your individual needs (Alam et. al., 2012).

III. **Security -** Smart homes provide great convenience, but they also face security risks, mainly due to weak authentication methods for users and devices. Attacks can occur both locally and remotely, raising concerns for homeowners. To address these issues, various projects are focusing on enhancing security by adapting proven techniques from traditional computer security, ensuring that our smart devices and personal information remain protected as technology evolves (Alam et. al., 2012).

1.2 History of Smart Homes

Smart home technology has reshaped modern living, making homes more convenient, energy-efficient, and secure. What began as simple automation has evolved into a network of intelligent, interconnected devices that adapt to user's needs. Advances in the Internet of Things (IoT) and artificial intelligence (AI) have enabled homes to

respond proactively, adjusting lighting, temperature, and security based on occupant's habits. Once a futuristic idea, the concept of a truly smart, intuitive living space is now a reality, enhancing comfort and efficiency in everyday life (Coutaz, 2018).

The roots of home automation can be traced back to ancient times, but significant progress began in the late 19th century with the development of electrical engineering. Thomas Edison's invention of the electric light bulb in 1879 was a game-changer, allowing people to control lighting in their homes for the first time. However, the modern concept of home automation started taking shape in the 20th century, beginning with simple systems for controlling lights and appliances (Harper, 2003).

In the 1970s, X10 emerged as one of the first widely adopted home automation protocols. This technology allowed devices to communicate over existing electrical wiring, enabling remote control of lights and appliances. While groundbreaking, early X10 systems were often unreliable and had limited functionality. The 1980s introduced the Clapper, a sound-activated device that let users turn lights on and off by clapping their hands. While it was a novelty, it could also be triggered by unintended noises, making it somewhat unpredictable (Chan et al., 2008).

By the 1980s and 1990s, early home automation systems offered basic control over lighting, heating, and security. These systems often relied on wired connections and had limited capabilities. The introduction of the internet in the late 1990s changed everything. With internet connectivity, home automation systems evolved, allowing users to control and monitor their homes remotely via web interfaces or mobile apps. This period saw the arrival of early security cameras and remote-controlled garage door openers (Balta-Ozkan et al., 2014).

The 2000s introduced smart thermostats, allowing users to manage heating and cooling remotely, leading to energy savings. Key milestones included the launch of the Nest Thermostat and the Amazon Echo. The 2010s saw a major leap in voice-controlled home automation, fueled by smartphones and Wi-Fi. Voice assistants like Amazon Alexa and Google Assistant became popular, providing intuitive ways to interact with devices. Smart lighting, thermostats, and doorbells became mainstream, making home automation widely accessible (Alam et al., 2012).

Tech giants like Apple, Amazon, and Google introduced ecosystems such as Apple HomeKit, Amazon Echo, and Google Home are creating centralized hubs for smart

home control. Industry standards like Zigbee, Z-Wave, and Thread were developed to ensure interoperability between devices from different manufacturers (Sicari et al., 2015).

As AI and machine learning became integrated into smart home devices, they enabled personalized automation and predictive features. Devices learned from user behavior and adjusted settings accordingly, making interactions more intuitive. For instance, AI-driven voice assistants became more conversational and context-aware, allowing users to engage with their smart homes naturally (Kumar et al., 2019).

In recent years, smart home technology has increasingly focused on energy efficiency and sustainability. Devices now optimize energy usage and reduce environmental impact. Smart thermostats, lighting, and appliances automatically adjust settings to conserve energy. However, with the rise of smart home technology, concerns about data privacy and security have also grown. Manufacturers and users alike recognize the need for secure and private smart home systems (Zhu et al., 2019).

The rollout of 5G networks is expected to enhance smart home capabilities, reducing latency and enabling real-time control. Edge computing, which processes data closer to the source, will improve response times for applications like security and automation. Emerging technologies such as augmented reality (AR) and virtual reality (VR) are also being integrated into smart home applications, allowing users to visualize furniture placements before purchasing (Li et al., 2021).

Gesture control technology is another exciting development, enabling users to interact with smart home devices through hand and body movements, making for a touchless experience. Additionally, robots are being developed for tasks within the smart home, including cleaning and security, enhancing convenience and efficiency (Qolomany et al., 2019).

Smart home security systems are incorporating advanced features such as biometric recognition, using fingerprint or facial recognition, alongside predictive analytics to enhance safety. Blockchain technology is also being explored to secure smart home applications, providing tamper-proof records of device interactions (Dorri et al., 2017).

Furthermore, smart home technologies are increasingly used to monitor occupants' health and well-being, with devices tracking air quality, allergens, and remote health

monitoring. The integration of smart homes into broader IoT ecosystems, including smart cities and energy grids, allows for enhanced coordination across various sectors, facilitating more efficient energy management and responsive urban infrastructure (Stojkoska & Trivodaliev, 2017).

1.3 Importance of Smart Homes Technology for working women

In recent years, the field of smart home technology has experienced significant growth and innovation, largely driven by the contributions of women in the industry. For many working women, balancing job responsibilities and household tasks can be overwhelming, but smart home technology helps make life easier (Balta-Ozkan et al., 2014). Devices like smart washing machines, robotic vacuum cleaners, and AI-powered kitchen appliances reduce the time spent on chores, allowing women to focus on their careers and personal well-being (Wang et al., 2017). Automated scheduling systems can sync work calendars with home automation, ensuring that important tasks like turning off appliances or locking doors happen automatically (Alam et al., 2012). This level of convenience not only saves time but also reduces stress, helping women manage both work and home more effectively (Kumar et al., 2019).

Safety is another major benefit of smart home technology, especially for women who spend long hours away from home (Dorri et al., 2017). Smart security cameras, motion sensors, and biometric locks provide real-time protection, allowing women to monitor their homes from their smartphones, no matter where they are (Stojkoska & Trivodaliev, 2017). Features like smart doorbells with facial recognition help verify visitors without opening the door, making homes safer for women living alone or with children (Wang et al., 2017). Automated lighting and alarm systems can deter potential intruders, giving working women peace of mind even when they are traveling or working late (Alam et al., 2012).

Beyond convenience and security, smart home technology also improves comfort and energy efficiency (Kumar et al., 2019). Smart thermostats adjust room temperatures based on personal preferences, ensuring a cozy environment after a long day at work (Balta-Ozkan et al., 2014). Air purifiers and automated lighting help create a healthier living space, improving air quality and reducing eye strain (Dorri et al., 2017). AI-powered voice assistants help women stay organized by reminding them about appointments, groceries, and even self-care routines (Stojkoska & Trivodaliev, 2017).

As smart homes continue to evolve, they are becoming an essential tool that empowers working women, making their lives more manageable, efficient, and secure (Wang et al., 2017).

Justification of the study

The integration of smart home technology is transforming modern living by enhancing convenience, energy efficiency, and security. However, many working women face challenges in adopting these technologies due to time constraints, lack of awareness, and limited access to user-friendly learning resources. Understanding and utilizing smart home solutions require basic technological literacy, which many women may not have the opportunity to develop due to their busy professional and personal responsibilities.

Numerous studies have been conducted at both National and International levels, focusing on the studies conducted such as, Review of Smart Homes—Past, Present and Future (Alam et al. 2012), Sensor Technology for Smart Homes (Ding et al. 2011), Smart Homes: Potentials and Challenges (El-Azab 2021), "Review on the Application of Artificial Intelligence in Smart Homes" (Guo et al. 2019), related to smart home technology. However, the researcher did not come across any study which focuses on developing an Audio-Visual aid and testing knowledge of working women regarding smart homes technology.

The aim of this study is to assess the knowledge of working women regarding smart home technology, develop an audio-visual aid to enhance their understanding, and evaluate its effectiveness through a comparative pre-post knowledge assessment. By simplifying complex concepts, the study seeks to empower working women with the necessary knowledge and skills to adopt smart home technologies, improving energy efficiency, convenience, and security in their daily lives.

The researcher aims to develop an audio-visual aid to facilitate the understanding of IoT-based automation, centralized control systems, energy-saving devices, and smart security solutions. This study, conducted among working women in Vadodara, Surat, and Ahmedabad, follows a structured pre-post knowledge assessment approach to measure its impact on their understanding and confidence in using smart home technology.

Although research has explored technology adoption and digital literacy, limited studies specifically focus on working women and the role of audio-visual learning tools in smart home technology adoption. Addressing this gap, the present study contributes to technological empowerment, energy-efficient living, and security awareness, ultimately supporting digital inclusion and smart home adoption among working professionals. The findings will serve as a valuable resource for educators, researchers, and policymakers in designing effective digital literacy interventions.

Statement of the problem

The aim of the present research was to develop an Audio- Visual aid on Smart Homes Technology among working women.

Objectives of the study

1. To study knowledge regarding Smart Homes Technology among working women.
2. To develop an Audio-Visual aid on Smart Homes Technology.
3. To assess the efficacy of developed Audio-Visual aid on Smart Homes Technology among working women through comparative analysis.

Delimitations of the study

1. The study will be limited to working women of 24-45 years of age group.

Hypothesis

1. There exists a difference in the extent of knowledge regarding smart homes technology among working women before and after circulation of Audio-Visual aid.

REVIEW OF LITERATURE

CHAPTER II

REVIEW OF LITERATURE

Review of literature play a vital role of any scientific study. The main aim of the present research was to find out knowledge of the respondents regarding Efficacy of developed Audio-Visual aid regarding Smart Homes Technology among working women. A review is an overview of the work done on the subject by qualified scholars and researchers. The chapter presents the major areas of related literature, survey, scholarly articles, books, and other sources relevant to a particular problem, area of research, or theory, providing a description, summary, and critical evolution of each work. To make the review more clear and understandable, the current chapter has been divided into the following sections:

2.1 Theoretical Orientation

Theoretical literature was divided in order to sequence of subheads:

2.1.1 Smart Home Network: Devices and Connectivity

2.1.1.1 Internet of Things (IOT)

2.1.1.2 Wired Networks Used in Smart Homes

2.1.1.3 Wireless Networks Used in Smart Homes

2.1.1.4 Hybrid Smart Home Networks

2.1.2 Market survey- Smart Home Appliances/Devices list

2.2 Empirical Studies

2.2.1 Researches conducted within India

2.2.2 Researches conducted outside India

2.3 Conclusion

2.1 Theoretical Orientation

2.1.1 Smart Home Network: Devices and Connectivity

2.1.1.1 Internet of Things (IOT):

The Internet of Things (IoT) is a network of interconnected devices that communicate and share data through the internet or local networks, significantly transforming smart home automation. By linking various devices such as sensors, appliances, and security systems, IoT enables seamless communication and control, enhancing the overall functionality of smart homes. These devices utilize communication protocols like Wi-Fi, ZigBee, Bluetooth, and Z-Wave to exchange information, while an IoT gateway serves as a central hub, connecting them to cloud-based services for data processing and storage. This architecture allows homeowners to remotely monitor and manage their smart appliances through mobile applications or voice assistants, creating a more integrated and user-friendly experience [(3)].

The integration of IoT in smart homes offers numerous benefits, including improved efficiency, security, and convenience. For instance, smart thermostats can automatically adjust settings based on real-time temperature data and user preferences, leading to energy savings (Gaekward et. al., 2015). Additionally, smart security systems can provide real-time alerts to homeowners in case of unusual activity, enhancing safety. By incorporating AI-powered automation, IoT creates a connected ecosystem where devices respond intelligently to user needs, ultimately enriching daily life and making home management more efficient and responsive [(4)].

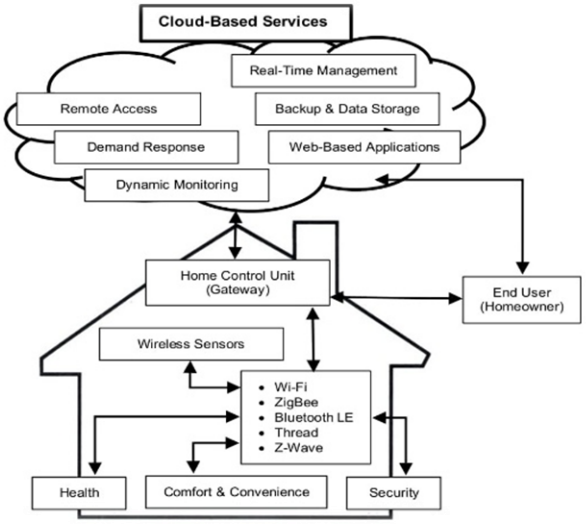


Plate 1: Smart Home network components ((Samuel, 2016)

2.1.1.2 Wired Networks Used in Smart Homes

I. **Ethernet (LAN)** - A Local Area Network (LAN) connects devices within a limited area, such as an office, building, or home, enabling them to communicate and share resources like files, printers, and internet access. Designed for short distances, LANs typically offer speeds ranging from 10 Mbps to 100 Mbps, with faster options becoming increasingly common. The most common network topologies for LANs include bus, ring, and star formations, each providing different advantages in terms of performance and reliability. These configurations help optimize the network's efficiency and ensure seamless connectivity among devices [(5)].

II. **Power Line Communication (PLC)** – Power Line Communication (PLC) is a method that allows for the transfer of both power and data over the same network of electrical wires. Essentially, it enables broadband data communication using the existing wiring that is already in place for transmitting electricity. This means that you can use your home or building's electrical wiring to send data signals, making it a convenient solution for connecting devices without the need for additional cables. PLC can also work through the broader electric power distribution system, making it a versatile option for enhancing connectivity in various settings [(6)].

III. **KNX** – A globally recognized wired standard for smart home and building automation, used to control lighting, security, HVAC, and energy management. It ensures seamless communication between various smart home devices using a single infrastructure. KNX is highly scalable and can integrate multiple automation functions [7].

IV. **X10 (Wired)** – One of the earliest home automation protocols, X10 transmits signals over existing electrical wiring. It is mainly used for basic smart home functions like controlling lights, alarms, and appliances. However, it has been largely replaced by more advanced technologies like Zigbee and Z-Wave [8].

2.1.1.3 Wireless Networks Used in Smart Homes

I. **Wi-Fi** – Wi-Fi is a wireless technology that enables electronic devices to connect to the internet and communicate with one another without the need for physical cables. It uses radio waves to transmit data between a Wi-Fi router and compatible devices, such as smartphones, computers, and smart home gadgets. Wi-Fi networks are commonly found in homes, offices, and public spaces, providing convenient internet access and local connectivity. This technology has become an essential part of modern digital life, allowing for wireless internet browsing, file sharing, and seamless communication between devices in various settings [9].

II. **Zigbee** – A low-power, short-range wireless protocol that creates a mesh network, allowing smart devices to communicate efficiently. It is commonly used for smart lighting, security systems, and energy management. Zigbee's ability to support a large number of devices makes it ideal for home automation[10].

III. **Z-Wave** – Similar to Zigbee, Z-Wave operates on a different frequency, reducing interference with Wi-Fi networks. It is designed specifically for smart home automation, offering secure, energy-efficient communication between devices. Z-Wave supports a strong mesh network, allowing devices to relay signals over a long range[11].

IV. **RFID (Radio Frequency Identification)** – RFID is a wireless communication technology that enables the automatic identification and tracking of objects, people, or animals using radio waves. Unlike barcode systems, RFID does not require direct contact or a line of sight between the reader and the tag, making it highly efficient. In smart homes, RFID enhances automation and security by allowing for easy inventory management of household items and enabling keyless entry systems. This technology improves convenience and safety, contributing to a more connected and efficient living environment [(12)].

V. **Bluetooth & Bluetooth Low Energy (BLE)** – Bluetooth is commonly used for short-range communication in smart locks, speakers, and wearables. BLE is a power-efficient version, ideal for battery-operated devices like smart sensors and trackers. Both versions offer secure and fast data transfer for home automation[(13)].

VI. **Thread** – A thread is a single sequence of execution within a process, often called a lightweight process due to its shared characteristics with traditional processes. In multithreading-capable operating systems, a single process can contain multiple threads, allowing for concurrent execution. However, the benefits of threading are most pronounced in systems with multiple CPU cores; if there is only one CPU, threads may need to context switch, leading to inefficiencies as they take turns using the CPU instead of executing simultaneously [(14)].

2.1.1.4 Hybrid Smart Home Networks

I. **Smart Home Energy Management Systems (SHEMS)** – These systems integrate multiple technologies like Wi-Fi, Zigbee, and PLC to optimize home energy usage. They monitor and control energy consumption by adjusting smart thermostats, lighting, and appliances based on real-time data. SHEMS help homeowners reduce electricity bills and improve energy efficiency[(15)].

II. **Insteon** – A hybrid network combining wired powerline communication and wireless RF technology. It offers fast and reliable communication between smart home devices, ensuring seamless automation. Insteon is known for its dual-band communication, reducing interference and increasing reliability [(16)].

2.1.2 Market survey- Smart Home Devices/Appliances list.

The following are the list of devices/appliances which are available in the market.

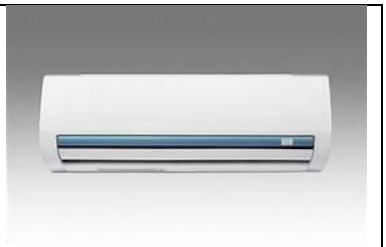
Table 1: List of Smart Homes Appliances/Devices available in market

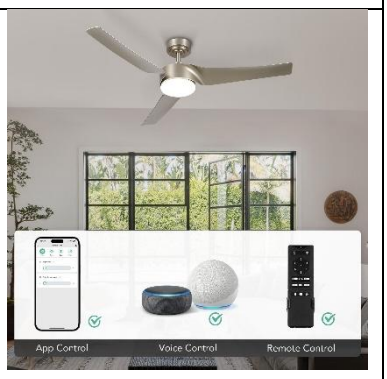
Sr. No.	Product Name	Description	Image
1.	Smart Switch Module	Allows remote control of lights and appliances smartphone or voice commands.	**Plate 2: Smart Switch Module [17]**
2.	Smart Wi-Fi board	Enables wireless connectivity for IoT devices, automating home appliances and security systems.	**Plate 3: Smart Wi-fi Board [18]**
3.	Smart Speaker	Acts as a voice assistant for playing music, answering queries, and controlling smart home devices.	**Plate 4: Smart Speaker [19]**

4.	Smart Wi-fi Circuit Breaker	Monitors and controls electricity usage remotely, enhancing safety and energy efficiency.	 **Plate 5: Smart Wi-fi circuit Breaker [20]**
5.	Smart Wi-fi Video Doorbell	Provides real-time video monitoring and two-way communication for enhanced home security.	 **Plate 6: Smart Wi-fi video doorbell [21]**
6.	Smart Security Cameras	Offers remote surveillance with motion detection and cloud storage for safety monitoring.	 **Plate 7: Smart Security cameras [22]**
7.	Smart Mops and Floor Cleaners	Automates floor cleaning with scheduled operation and app-based controls.	 **Plate 8: Smart Mops and Floor Cleaners [23]**

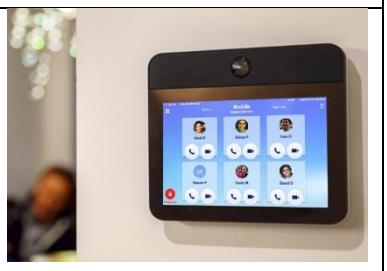
8.	Smart Hubs and Controllers	Centralizes the control of multiple smart devices for seamless automation.	 **Plate 9: Smart Hubs and Controllers[24]**
9.	Smart Glasses	Provides augmented reality (AR) features for hands-free navigation, calls, and notifications.	 **Plate 10: Smart Glasses [25]**
10.	Smart Thermostats	Regulates home temperature based on user preferences, reducing energy consumption.	 **Plate 11: Smart Thermostats [26]**
11.	Smart Television	Connects to the internet for streaming, voice control, and smart home integration.	 **Plate 12: Smart Television [27]**
12.	Smart Refrigerator	Tracks food inventory, suggests recipes, and maintains optimal cooling settings.	 **Plate 13: Smart Refrigerator [28]**

13.	Smart Microwave/ oven	Allows remote preheating, voice commands, and precise cooking automation.	**Plate 14: Smart Microwave/ oven [29]**
14.	Smart Washing Machine	Enables remote operation, load detection, and customized washing cycles.	**Plate 15: Smart Microwave/ oven [30]**
15.	Smart Dishwasher	Optimizes water usage, provides remote start options, and offers cycle customization.	**Plate 16: Smart Dishwasher [31]**
16.	Smart Coffee Maker	Brews coffee on schedule or via smartphone control for convenience.	**Plate 17: Smart Coffee Maker[32]**

17.	Smart Air conditioner	Adjusts temperature remotely and optimizes energy consumption based on usage.	 **Plate 18: Smart Air Conditioner**[33]
18.	Smart Heaters and Radiators	Provides remote temperature control and scheduling for efficient heating.	**Plate 19**: **Smart Heaters and Radiators**[34]
19.	Smart Watch	A connected timepiece with features like voice control, weather updates, alarms, and integration with smart home devices for enhanced convenience.	**Plate 19**: **Smart Watch**[35]
20.	Smart Door Locks	Enhances security with keyless entry, remote access, and biometric authentication.	**Plate 21**: **Smart Door Locks** [36]

21.	Smart Curtains and Blinds	Automates opening and closing based on schedules or voice commands for privacy and energy efficiency.	 **Plate 22: Smart Curtains and Blinds[37]**
22.	Smart Ceiling Fans	These fans can be controlled via smartphone apps or voice assistants, allowing users to adjust speed, direction, and scheduling for energy efficiency and convenience.	 **Plate 23: Smart Ceiling Fans[38]**
23.	Smart Safes	Equipped with biometric authentication, PIN codes, or mobile app access, smart safes offer enhanced security, remote monitoring, and alerts in case of unauthorized access.	 **Plate 24: Smart Safes[39]**
24.	Smart Bulbs	Wi-Fi or Bluetooth-enabled bulbs that can change colours, dim, and be scheduled remotely via mobile apps or voice assistants, optimizing ambiance and energy savings.	 **Plate 25: Smart Bulbs [40]**
25.	Voice Assistants	AI-powered devices like Amazon Alexa or Google Assistant that enable hands-free control of smart home devices, provide information, and assist with daily tasks.	 **Plate 26: Voice Assistance [41]**

26.	Smart Light Switches	Internet-connected switches that allow remote operation of home lighting, automation based on schedules, and integration with voice assistants for hands-free control.	**Plate 27: Smart Light Switches[42]**
27.	Smart Energy Meter	Advanced meters that provide real-time energy consumption data, helping users track electricity usage, reduce wastage, and optimize power bills efficiently.	**Plate 28: Smart Energy Meter[43]**
28.	Streaming Devices	Gadgets like Amazon Fire Stick or Roku that transform regular TVs into smart entertainment hubs, enabling access to online streaming platforms and voice controls.	**Plate 29: Streaming Devices[44]**
29.	Smart Air purifier	IoT-enabled purifiers that monitor air quality, automatically adjust purification levels, and send alerts via mobile apps for cleaner indoor air.	**Plate 30: Smart Air Purifier[45]**
30.	Smart Trackers	GPS or Bluetooth-enabled devices that help locate lost items such as keys, wallets, or even pets, with real-time tracking through a smartphone app.	**Plate 31: Smart Trackers[46]**

31.	Smart Garage Door openers	Wi-Fi-enabled devices that allow remote control, scheduled access, and security alerts for garage doors via smartphone apps or voice assistants.	**Plate 32: Smart Garage Door openers[47]**
32.	Smart Blenders and cookers	These kitchen appliances use IoT and AI to automate cooking processes, offering remote control, preset recipes, and precision cooking.	**Plate 33: Smart Blenders and cookers[48]**
33.	Smart Home Theatre systems	Advanced entertainment setups with voice control, automation, and wireless streaming, delivering an immersive cinematic experience.	**Plate 33: Smart Home Theatre system[49]**
34.	Smart Intercom systems	Wireless or wired communication systems with video and voice integration, enabling secure, hands-free communication within a smart home.	 **Plate 35: Smart Intercom system[50]**

2.2 Empirical Studies

2.2.1 Researches conducted within India

Kumar and Chawda (2020) conducted a study titled "A Research Paper on Smart Home," which explores the role of IoT in smart home development and its impact on daily life. The study aimed to analyse the growing importance of IoT devices such as smartwatches, laptops, cars, bikes, mobiles, tablets, and sensor-based devices in modern households. The methodology involved an exploratory review of IoT applications in smart homes, focusing on automation and ease of control through voice commands, sensors, and remote controls. The locale of the study was not explicitly mentioned, as the research provided a general overview of smart home technology. The major findings highlighted that smart homes offer convenience, efficiency, and modern aesthetics but remain expensive, limiting widespread adoption. The study emphasized that despite cost barriers, the demand for smart homes is increasing globally due to their benefits, such as automated lighting, voice-controlled operations, and sensor-based functionalities, making everyday tasks easier and more efficient.

Morita (2021) conducted a scoping review titled "Health Monitoring Using Smart Home Technologies" to explore the integration of IoT-based smart home technologies in healthcare. The study aimed to survey current technologies and applications for in-home health monitoring and analyse their effectiveness in supporting population health through continuous behavioural monitoring. The methodology involved a systematic review of 49 peer-reviewed studies from 2008 to 2021, extracted from PubMed, Scopus, ScienceDirect, and CINAHL databases. The locale of the study was primarily Europe and North America, where most research was conducted. The major findings revealed that smart home health monitoring systems predominantly use passive infrared sensors for motion detection and apply various data analysis, management, and machine learning techniques. However, challenges such as differentiating multiple users in a space, technology interoperability, and data security and privacy concerns persist. The study also highlighted a lack of collaboration across disciplines, with a greater focus on technological development over human-centric applications. Additionally, the review found that healthcare research lacked a concrete definition of smart homes, prompting the authors to propose a new definition tailored to healthcare applications. The research

concluded that interdisciplinary approaches are necessary for the successful integration of smart home technologies into the healthcare sector.

Triboan and Meggi (2019) conducted a study titled "Reformulating a Smart Home System for the Indian Context: Diu Island", focusing on adapting smart home technologies to the Indian urban landscape. The study aimed to explore how smart homes and Ambient Assistive Living (AAL) systems can improve the quality of life for the elderly population in Diu Island, a recently announced Smart City in India. The research methodology included a case study approach, analysing urban, environmental, and economic challenges in the region while proposing a hybrid smart home system. The locale of the study was Diu Island, India, where the elderly native population faces challenges related to independent living and accessibility. The study proposed a smart home system integrating edge and cloud computing to create a self-powering, energy-efficient, and low-latency environment for elderly assistance. The major findings highlighted the importance of technology-driven solutions in smart cities, particularly in addressing health, safety, and accessibility issues for senior citizens. The research concluded that hybrid computing paradigms can significantly enhance smart home efficiency while making them more responsive and adaptable to local needs.

Ahmad (2011) conducted a study titled "Smart Metering and Home Automation Solutions for the Next Decade" explores the role of smart metering and home automation technologies in enhancing energy efficiency and sustainability. The study emphasizes that the next decade will witness a revolution in Advanced Metering Infrastructure (AMI), Information and Communications Technology (ICT), and home automation, making these technologies more affordable and accessible to the general public. The research highlights the global adoption of AMI solutions, with countries such as the USA, Australia, and Italy already implementing smart metering, while nations like China, South Korea, and several European countries are in the process of adopting these systems. The locale of the study includes India, where the Restructured Accelerated Power Development & Reform Program (R-APDRP) under the XI Five-Year Plan has laid the foundation for smart metering and ICT solutions to improve efficiency, reduce losses, prevent energy theft, and enable better energy management in the electrical sector. The study discusses Short Distance Radio Frequency (RF) technologies like ZigBee, Z-Wave, Low Power Radio, and Distribution Line Carrier (DLC), which are set to become commonplace in households as part of future Home

Area Networks (HANs). The major findings highlight that AMI and home automation will transform energy management, leading to a greener and more efficient energy system while supporting sustainable development and improved energy accounting.

Datta (2018) conducted a study titled "The Smart Safe City: Gendered Time, Speed, and Violence in the Margins of India's Urban Age" to examine the impact of rapid urbanization and smart city initiatives on women living in urban peripheries. The study aimed to analyse how the concept of the 'smart safe city' influences gendered experiences of time, mobility, and violence. The methodology involved time-mapping, participatory workshops, WhatsApp diaries, and in-depth interviews with young women navigating urban life. The locale of the study focused on urban margins in India, where women balance precarious employment and entrenched gender power dynamics at home. The major findings revealed that women in these areas experience time struggles between the fast pace of urban life and the demands of family responsibilities. While smart city technologies aim to enhance safety, young women rely heavily on mobile phones to manage daily challenges and personal security. The study concluded that while digital tools provide some agency, they also reinforce slow, structural violence that remains largely invisible, unfolding over time and space.

Tayeng et al. (2024) conducted a study titled "Smart City Initiatives and Urban Governance in India: Evaluating Technological Interventions for Sustainable Development" to examine the role of smart city technologies in urban governance and sustainability. The study aimed to analyse the effectiveness of smart city initiatives in improving infrastructure, public services, and environmental sustainability in India. The methodology involved a comparative analysis of multiple smart city projects across different Indian states, assessing their technological interventions, policy frameworks, and governance models. The locale of the study covered major Indian cities that are part of the Smart Cities Mission, launched by the Government of India. The major findings highlighted that technology-driven governance models have improved service delivery in urban areas, particularly in waste management, traffic control, and public safety. However, challenges such as digital divide, inadequate public participation, and issues related to data privacy and security remain critical concerns. The study emphasized the need for integrating local governance structures with technological advancements to ensure inclusive and sustainable urban development. It concluded that

while smart city initiatives have potential, their long-term success depends on adaptive governance, stakeholder collaboration, and citizen-centric approaches.

Desai & Iyer (2024) conducted a study titled "Smart Home Energy Management System Using IoT in Indian Urban Areas" to evaluate the effectiveness of IoT-based Smart Home Energy Management Systems (SHEMS) in improving energy efficiency and reducing electricity consumption in Indian urban areas. The study aimed to analyse patterns of energy consumption and optimization techniques through IoT-enabled sensors, smart meters, and cloud-based monitoring systems. The methodology involved case studies and experimental analysis, where smart home energy systems were implemented in urban residential households to collect data on appliance usage, energy wastage, and optimization through automation. The locale of the study focused on urban residential areas of India, particularly middle-income and high-income households adopting smart home technologies. The major findings revealed that IoT-based SHEMS significantly reduced electricity wastage by automating appliance usage and integrating renewable energy sources, though challenges such as high installation costs, lack of consumer awareness, and cybersecurity concerns limited large-scale adoption. The study concluded that while IoT-enabled energy management systems contribute to sustainable energy consumption, policy interventions, affordability measures, and consumer education are essential for wider adoption and long-term impact.

Verma & Singh (2024) conducted a study titled "Smart Home Assistive Technologies for Elderly in India: A Case Study on Bengaluru" to examine the role of IoT-enabled smart home assistive technologies in enhancing the quality of life for the elderly in urban India. The study aimed to analyze the effectiveness of automated home systems, health monitoring devices, and AI-based assistive solutions in addressing age-related challenges such as mobility issues, emergency response, and independent living. The methodology involved a case study approach, where data was collected from elderly residents in Bengaluru using structured interviews, observational studies, and usability assessments of smart home technologies. The locale of the study was Bengaluru, India, a rapidly urbanizing city with a growing elderly population adopting smart home solutions. The major findings revealed that smart home assistive technologies improved safety, healthcare accessibility, and daily convenience for the elderly, but barriers such as high costs, digital literacy gaps, and interoperability issues hindered widespread

adoption. The study concluded that while smart home assistive technologies can significantly improve elderly care in urban India, policy support, affordability measures, and user-friendly designs are necessary for better integration and accessibility.

Sharma & Patel (2024) conducted a study titled "IoT-Based Smart Home Automation in India: Challenges and Opportunities" to explore the adoption and implementation of smart home automation systems in the Indian context. The study aimed to analyse the benefits, challenges, and future prospects of IoT-driven home automation, focusing on energy efficiency, security, and convenience. The methodology involved a survey of homeowners, industry experts, and technology providers, along with a review of existing smart home infrastructures across urban and semi-urban areas in India. The locale of the study included major metropolitan cities such as Delhi, Mumbai, and Bengaluru, where smart home adoption is gaining momentum. The major findings revealed that IoT-based home automation enhances energy management, security, and user comfort, but challenges such as high initial costs, cybersecurity concerns, and lack of interoperability between different devices hinder large-scale adoption. The study concluded that while India presents significant opportunities for smart home automation, overcoming cost barriers, improving cybersecurity measures, and ensuring seamless integration of IoT devices will be crucial for wider adoption and long-term sustainability.

2.2.2 Researches conducted outside India

Alam et al. (2012) conducted a comprehensive study titled "Review of Smart Homes—Past, Present, and Future," which analysed the evolution of smart home technology and its impact on modern living. The research focused on the integration of ubiquitous computing in home environments, emphasizing how ambient intelligence facilitates context-aware services and remote control. Key components essential for smart home implementation, such as sensors, multimedia devices, communication protocols, and control systems, were reviewed. Utilizing a literature review methodology, the study examined the roles of artificial intelligence (AI) and the Internet of Things (IoT) in enhancing automation, security, and energy efficiency. The findings revealed a significant transition in smart homes from basic automation to highly interconnected systems that can learn user behaviours and optimize functionality. Additionally, the

study addressed challenges like interoperability, cybersecurity risks, and the necessity for sustainable infrastructure in the development of smart homes.

Chan et al. (2008) conducted a comprehensive review on "Smart Homes-Current Features and Future Perspectives" in developed countries. The study focused on the role of smart home technology in improving healthcare, independence, and quality of life for the elderly and disabled. It highlighted how smart homes, equipped with sensors, actuators, and biomedical monitors, can provide 24-hour assistance while maintaining a non-intrusive environment. The study utilized a literature review methodology, analysing various smart home projects across developed nations. The findings emphasized that smart home technology can enhance home-based healthcare, reduce hospitalization rates, and mitigate social isolation among vulnerable populations. The review also discussed the advantages and challenges of smart home implementation, including technological feasibility, user acceptance, and cost-effectiveness. Furthermore, it explored the future potential of smart home networks, including wearable and implantable devices that enable continuous health monitoring beyond the home environment.

Ding et al. (2011) conducted a comprehensive review on "Sensor Technology for Smart Homes" in developed countries, focusing on how smart homes support independent living for people with disabilities and older adults. The study emphasized that smart homes rely on networked sensors to monitor daily activities, safety, and behavioural changes of residents. The methodology involved an extensive literature review of sensor technologies used in smart home environments, particularly direct environment sensing and infrastructure-mediated sensing. The findings highlighted that low power sensors, embedded processors, and wireless networks enable real-time monitoring, reducing caregiver workload while enhancing home automation and healthcare integration. However, challenges remain, including technical limitations, ethical concerns, and the need for cost-benefit analyses. The study concluded that future research should prioritize user centred sensor technologies that cater to the actual needs of end users, caregivers, and healthcare professionals, ensuring seamless adoption and effectiveness in real-world smart home applications.

Ozkan et al. (2013) conducted a study on "Social Barriers to the Adoption of Smart Homes" in the United Kingdom, analysing public attitudes and expert views on smart

home technologies. The study explored how smart home services aim to enhance comfort, convenience, energy efficiency, and security, yet their adoption remains limited. The methodology involved a combination of in-depth deliberative public workshops, expert interviews, and a literature review to identify key barriers to smart home adoption. The findings revealed that factors such as control, security concerns, high costs, and lack of awareness hinder widespread implementation. The study emphasized that barriers vary based on expertise, life stage, and location, influencing user willingness to adopt smart home technology. Additionally, it provided valuable insights for policymakers, smart home designers, and developers on addressing these obstacles to encourage broader acceptance of smart home innovations.

El-Azab (2021) conducted a study titled "Smart Homes: Potentials and Challenges", aiming to explore the role of smart homes in integrating decentralized clean-energy sources, optimizing energy management, and addressing power grid challenges. Using a literature review methodology, the study analysed data from existing research, case studies, and industry reports, with a focus on regions implementing renewable energy in residential power systems. The research highlighted that smart homes can reduce grid dependency by efficiently managing energy consumption and selling excess clean energy to utilities. A key finding emphasized that energy-management systems are essential for coordinating appliances, storage units, and homeowner needs, ensuring both economic benefits and operational efficiency. However, challenges such as the intermittent nature of renewable energy and its potential impact on grid stability were identified, necessitating advanced energy-management strategies. The study further noted that the increasing penetration of smart-home energy into grids introduces complexities in load balancing, generation, and overall stability. Ultimately, the research concluded that optimized energy-management schemes are crucial for sustainable smart-grid integration, ensuring reliability and efficiency in modern power systems.

Guo et al. (2019) conducted a study titled "Review on the Application of Artificial Intelligence in Smart Homes", aiming to analyse the trends of AI-driven smart home technologies and the relationship between academic literature and real-world product development. Using a literature and product review methodology, the study examined research papers and commercial smart home products to assess the current status and future directions of AI integration in smart homes. The research was conducted across

various regions adopting smart home technologies, with a focus on AI-driven automation and user interactions. The major findings highlighted that AI enhances smart home functionalities by improving automation, personalization, and user convenience, but a gap exists between academic research and market-ready products. The study revealed that while AI-powered smart homes are evolving, there is a delay in translating research advancements into commercial applications. The research concluded that as AI-driven intelligent interactions continue to advance, smart homes will become more adaptive and user-friendly, shaping the future of residential automation.

Batalla (2017) conducted a study on "Secure Smart Homes: Opportunities and Challenges", focusing on the security and management issues in smart home environments. The study aimed to address the increased risks associated with low-capacity sensors, multiple internet connections, and system heterogeneity, which require users to manage complex configurations. The methodology involved a literature review of existing security frameworks and market practices to develop secure smart home systems. The locale of the study was global, as it analyzed security challenges and solutions applicable to smart homes worldwide. The findings highlighted that current security measures remain inadequate, and the study proposed future solutions for efficient and secure smart home management, emphasizing user-friendly configurations, cybersecurity improvements, and advanced data protection methods to ensure safer smart home environments.

Gaikwad et al. (2015) conducted a study on "A Survey Based on Smart Home Systems Using Internet-of-Things", focusing on the integration of IoT technology in smart home environments. The study aimed to analyze the architecture, security concerns, and management challenges of IoT-based smart homes. The methodology involved a survey of existing IoT-based smart home systems, highlighting network architecture, standard protocols, and automation techniques. The locale of the study was unspecified, but the research applied to global IoT smart home implementations. The findings emphasized that while IoT enhances home automation, remote control, and monitoring, challenges such as security vulnerabilities, system management, and interoperability issues remain. The study also proposed potential solutions to overcome these challenges, including better security frameworks and efficient system management techniques for seamless IoT-based smart home integration.

Schieweck et al. (2018) conducted a study on "Smart Homes and the Control of Indoor Air Quality," focusing on the impact of smart home technology on indoor environmental conditions, air quality, and occupant behaviour. The research aimed to analyse how sensor-based networks contribute to indoor air quality, thermal comfort, and living behaviour in smart homes, particularly in Central Europe. The methodology involved a literature review of environmental monitoring, ventilation systems, and smart home automation. The locale of the study was Central Europe, where climate change, demographic shifts, and modern construction practices are influencing smart home adoption. The findings highlighted that while smart homes enhance energy efficiency and ventilation, they also demand significant behavioral adjustments from occupants. Additionally, challenges related to sensor technology limitations, data security concerns, and the control of indoor pollutants were identified. The study emphasized the importance of user acceptance and the need for better integration of air quality control technologies in smart home systems.

Sivaraman et al. (2016) conducted a study titled "Smart-Phones Attacking Smart-Homes", examining security vulnerabilities in smart-home IoT devices due to smartphone-based attacks. The study aimed to demonstrate how malicious smartphone applications can bypass traditional home network security and compromise smart-home devices. The methodology involved simulating an attack scenario where a doctored smartphone app scans for weak IoT devices, reports them to an external entity, and modifies firewall settings to allow remote access. The locale of the study was home network environments where smart-home devices are integrated with internet-connected routers. The findings revealed that home routers provide inadequate security against cyber threats, as attackers can exploit smartphone apps to infiltrate smart-home networks. The study highlighted the critical need for stronger security measures in IoT devices, improved authentication protocols, and enhanced user awareness to prevent unauthorized access and potential cyberattacks.

Ukpene and Apaokueze (2024) conducted a study titled "The Impact of Smart Home Technologies on Energy Efficiency, Cost Savings, and Environmental Benefits," focusing on the effectiveness of smart home technologies in reducing energy consumption, costs, and carbon emissions in Nigerian households. The study aimed to assess how smart thermostats, lighting systems, appliances, plugs, and energy monitoring systems contribute to energy savings and sustainability. The methodology

included survey data collection and statistical analysis across five major Nigerian cities: Lagos, Abuja, Kano, Port Harcourt, and Enugu. Data analysis involved descriptive statistics and regression modelling to evaluate energy savings, cost reductions, and environmental benefits. The findings indicated that smart technologies reduced overall energy consumption by 15–25%, with smart appliances achieving the highest reduction of up to 25%. Households experienced monthly cost savings of up to 4000 NGN, while CO_2 emissions decreased by 500–700 kg annually per household, highlighting significant environmental benefits. However, the study also identified barriers such as high initial costs and limited awareness. The researchers recommended financial incentives, enhanced policy promotion, and improvements in distribution systems to accelerate adoption and maximize the impact of smart home technologies in Nigeria.

Schulz and Scilla (2024) conducted a study titled "Broad Perspective of Smart Home Technology in 2024," focusing on the evolution of smart homes from traditional spaces to interconnected environments that offer improved convenience, security, and energy efficiency. The study aimed to analyse the benefits and challenges of smart home integration while exploring emerging trends and innovations. The methodology involved a comparative analysis of hub-based and hub-free systems, systematically evaluating their respective advantages and disadvantages. The locale of the study was not explicitly mentioned, but it broadly examined global advancements in smart home technology. The major findings highlighted that healthcare monitoring, smart grid energy management, and the integration of augmented and virtual reality are key innovations shaping smart home ecosystems. Additionally, the study emphasized the role of artificial intelligence in enhancing smart home capabilities, making homes more adaptive and intelligent. Despite the promising advancements, challenges such as interoperability, cybersecurity, and affordability remain critical factors influencing widespread adoption.

De Silva et al. (2012) conducted a study titled "State of the Art of Smart Homes," which provides a comprehensive review of smart home research from multiple perspectives. The study aimed to analyse various techniques and applications related to smart homes. The methodology included a survey of computer vision-based, audio-based, and multimodal techniques used in smart home systems. Additionally, the research examined specific applications such as eldercare, childcare, and energy efficiency solutions, as well as multimedia retrieval for ubiquitous environments. The locale of

the study was not explicitly mentioned, as it focused on a broad review of global advancements in smart home technology. The major findings indicated that video-based security applications have reached a level of maturity, whereas areas such as smart homes for energy efficiency and video summarization are gaining renewed research interest. The study emphasized that while some aspects of smart home technology are well-developed, others require further exploration and innovation to enhance their practical implementation.

2.3 Conclusion

Studies conducted abroad have explored various aspects of smart home technology, including its impact on energy efficiency, security, and convenience. Research has also focused on user attitudes, adoption behaviour, and the role of IoT in enhancing daily life. Studies within India have examined multiple dimensions such as awareness, accessibility, affordability, and the effectiveness of smart home automation. Other areas of research include user perception of centralized control systems, automated appliances, and challenges related to data security and privacy. Some studies have also highlighted the role of women in adopting and managing smart home technologies within households. After reviewing the available literature, a need was identified to conceptualize a study on the Efficacy of Developed Audio-Visual Aid on Smart Home Technology among Working Women to assess its impact on their knowledge and understanding.

METHODOLOGY

CHAPTER III

METHODOLOGY

Research methodology is a coherent group of methods that harmonize one another and that have the capability to fit to deliver data and findings that will reflect the research question and suits the researcher's purpose (Creswell and Creswell, 2018). The methodological part of the research contains –the research design, variables under the study, sample size and sampling procedures, tools for data collection, and operational definitions of the terms used in the study, which are explained briefly in this chapter. The main purpose of this present research was to study efficacy of developed audiovisual aid on Smart Homes Technology among working women by conducting a pre and post knowledge assessment. To achieve the aims of the present study, a detailed and sequential procedure was followed which is presented in this chapter under the following sub-headings:

3.1 Research Design
3.2 Operational Definitions
3.3 Locale of Study
3.4 Unit of Inquiry
3.5 Sampling size and Sampling procedure
3.6 Selection, Development, and Description of the tools
3.7 Establishment of content validity of the tool
3.8 Establishment of Reliability of the tool
3.9 Efficacy Assessment of Audio-Visual aid on Smart Homes Technology
3.10 Data Collection
3.11 Data Analysis

3.1 Research Design

According to Andrew B Kirumbi (2018), “Research design is the set of methods and procedures used in collecting and analysing measures of the variables specified in the research problem”. The research design for the present study was descriptive in nature. According to Kothari and Garg (2019), “Descriptive research studies are those studies which are concerned with describing the characteristics of a particular individual or a group”. Descriptive design was thought to be the most appropriate method to carry out the present research because it aims to conduct a pre and post knowledge-based assessment on smart homes technology for working women based on audio visual aid.

3.2 Operational definitions

According to Ahuja (2011), Operational definition of a concept or a variable assign measuring to a construct by specifying the activities necessary to measure the construct a variable. Clear of the methods used to measure or alter variables in order to facilitate understanding and analysis of the research. The operational definitions formulated for the present research study are given below:

3.2.1 Efficacy: For the present study, Efficacy refers to the effectiveness of audio-visual aid towards the knowledge among the respondents towards Smart Homes Technology.

3.2.2 Audio visual aid: For the present study, Audio-Visual aid referred to a development of a video on Smart Homes Technology.

3.2.3 Smart homes Technology: For the present study, Smart Homes Technology refers to the integration of devices, systems, and applications in a residential environment that connect to a network to enable automation, remote control, and enhanced functionality.

3.3.4 Working women: For the present study, working women refers to the women who are gainfully employed and managing dual roles of family and workspace, aged between 24-45 years of age with minimum 1 year of working experience.

3.3 Locale of the study

The present study was conducted in Vadodara, Ahmedabad and Surat cities of the Gujarat state in India. These three cities were selected purposively as collecting data from these cities was most feasible for the research.

I. Vadodara:

Vadodara, also known as Baroda, is one of the prominent cities in Gujarat, located on the banks of the Vishwamitri River. It is the third-largest city in the state and is often referred to as the cultural capital of Gujarat. Vadodara is renowned for its rich history, magnificent palaces, and educational institutions. The city boasts a blend of modernity and tradition, with historical landmarks like the Lakshmi Vilas Palace, which is a prime example of Indo-Saracenic architecture, and the Baroda Museum & Picture Gallery, which houses a vast collection of art and historical artifacts. Vadodara is also a major industrial hub, with key sectors such as petrochemicals, chemicals, and manufacturing industries contributing to its economy. The city is famous for hosting the annual Vadodara Maha-Rathyatra, a grand procession dedicated to Lord Jagannath, showcasing its deep-rooted cultural traditions.

II. Ahmedabad:

Ahmedabad is the largest city in Gujarat and the state's economic and cultural center. Situated on the banks of the Sabarmati River, Ahmedabad is known for its vibrant history, textile industry, and its significance during India's independence movement. It was the home of Mahatma Gandhi and the site of his ashram, Sabarmati Ashram, which remains a major historical landmark. The city has a unique architectural heritage, blending the old and the new, with the intricately carved structures of the old city and modern buildings dotting its skyline. Ahmedabad is also recognized as a UNESCO World Heritage City due to its well-preserved heritage precincts, including the Bhadra Fort and the Jama Masjid. The city's economy is diverse, with a strong presence in textile manufacturing, information technology, and education. It is also known for its culinary delights, especially dishes like dhokla and khaman. The International Kite Festival, celebrated every year, adds to the city's global appeal.

III. Surat:

Surat, often referred to as the "Diamond City" and "Silk City," is one of the fastest-growing cities in Gujarat and India. It lies along the Tapi River and is known for its thriving diamond and textile industries. Surat processes more than 90% of the world's diamonds and is a global centre for diamond cutting and polishing. The city is also famous for its textile industry, particularly the production of synthetic fabrics, making it a major hub in the fashion and apparel sector. Surat's rich history dates back to the Mughal era, and it was once one of the busiest ports in India, trading spices, textiles, and other goods. The city features modern infrastructure, including wide roads, shopping malls, and business centers, alongside historical monuments such as the Surat Castle and the Sarthana Nature Park. Surat is also known for its food, with its unique combination of Gujarati and Mughlai cuisines, and for the vibrant festivals celebrated throughout the year.

Plate 33: Map of Gujarat showing Selected City for Present Research

https://in.images.search.yahoo.com/search/images;_ylt=AwrKDmacoXtn.wEAGaS7HAx.;_ylu=Y29sbwNzZzMEcG9zAzEEdnRpZAMEc2VjA3BpdnM-?p=gujarat+map&fr2=piv-web&type=E210IN885G0&fr=mcafee#id=2&iurl=http%3A%2F%2Fupload.wikimedia.org%2Fwikipedia%2Fcommons%2F0%2F0a%2FMap_Gujarat_state_and_districts.png&action=click

3.4 Unit of inquiry

The unit of inquiry were the working women residing in selected cities of Gujarat between the age group of 24 to 45 years with minimum 1 year of working experience who gave their consent and willingly cooperated to provide information as asked in the tool.

3.5 Sampling size and sampling procedure

For the present study, the purposive snowball technique was considered to be the most appropriate. The data was collected from 150 working women between the age group of 24 to 45 years with minimum 1 year of working experience.

3.5.1 Inclusion criteria

1. The study will include working women living with their families.
2. The study will include working women managing dual roles.
3. The study will include working women with medium fluency in English Language.

3.5.2 Exclusion criteria

1. The study will exclude working women who will not give consent to participate in the study.
2. The study will exclude working women below 24 years and above 45 years.
3. The study will exclude working women living as paying guests or on sharing basis.

3.6 Selection, Development and Description of the tool

3.6.1 Selection of the tool

For the present study, a questionnaire was used for collecting the data. Based on objectives framed for the study and the literature reviewed the tool was constructed. Various sources such as books, journals and electronic were used to make the tool for the present research.

Advantages of using questionnaire tool:

I. Respondents can answer anonymously, which often leads to more honest and accurate responses.

II. All respondents receive the same set of questions, ensuring consistency in data collection.
III. They can be sent to a large and diverse audience, enabling data collection from various demographics.
IV. Responses can be collected and analysed quickly, particularly with digital tools.
V. Responses are automatically documented, providing a record that can be revisited or verified.
VI. Participants can fill out questionnaires at their convenience, increasing response rates.
VII. Can include a mix of open-ended and closed-ended questions to gather both qualitative and quantitative data.

3.6.2 Development of the tool

Based on the information collected during the review of literature, experts' guidance, and personal observation of the researcher, the questionnaire was developed. Considering all the aspects, all statements were included that would elicit the information needed to attain the objectives of the study.

3.6.3 Description of the tool

A structured questionnaire was constructed keeping in the view the objectives of the study. It comprised of the following three sections:

Section I: Background Information

This section contained questions related to respondents background information such as name, email id, phone number, age (in years), place, type of occupation, education, monthly income, marital status, type of family, number of total family members, number of elderly in family, number of children in family, any specially abled in family, number of earning members in the family, type of house, number of smart household devices at home, Ownership of smart homes voice assistance.

Section II : Knowledge regarding "Smart Homes Technology" (before circulation of Audio-Visual aid)

This section contained statements to enquire about knowledge regarding smart homes technology among working women. The section aimed to assess the extent of knowledge about smart homes. The statements were formulated after a through review of available literature. The response structure for this scale was based on a 3 point continuum likert rating scale where responses were "Agree", "Undecided" and "Disagree".

Section III : Knowledge regarding "Smart Homes Technology" (Will be administrated after circulation of Audio-Visual aid)

This section contained statements to enquire about knowledge regarding smart homes technology among working women. The section aimed to assess the efficacy of developed Audio-Visual aid (video) on smart homes technology among working women. The response structure for this scale was based on a 3 point continuum likert rating scale where responses were "Agree", "Undecided" and "Disagree".

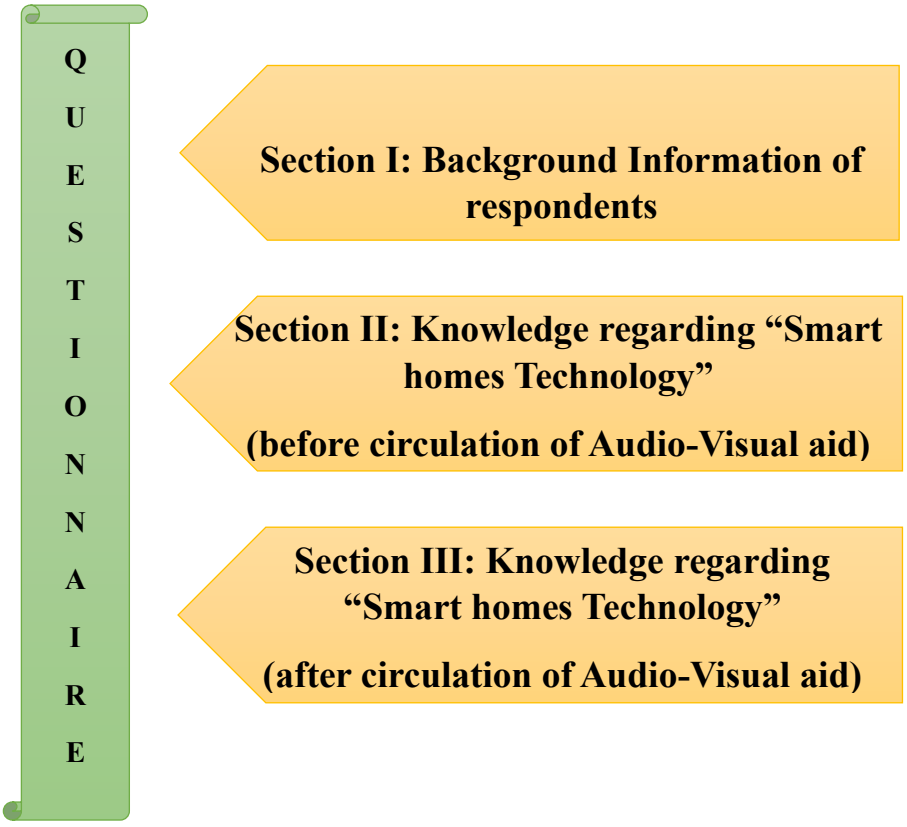


Figure 1: Description of the tool

3.7 Establishment of content validity of the tool

Based on available existing literature, a tool regarding assessment based on knowledge of smart homes technology among working women was prepared given to the panel of 10 judges comprising experts from the field of interior design and Family and community sciences. The exerts were requested to state whether each statement fell in a category under which it was listed and to check the ambiguity, clarity and relevance of the content for each scale. The suggestions of judges were taken into consideration for the inclusion of the statement in the final tool. Changes were made accordingly and the final tool was prepared.

The content validity was confirmed with the help of five judges related to the field of Faculty of Family and Community Resource Management. The suggestions given by experts were incorporated and changes were done accordingly. The Audio-Visual aid comprised of various aspects of Smart Homes Technology including IoT-based automation, centralized control systems, security enhancements, energy efficiency, and the impact of smart home devices on daily life.

3.8 Establishment of Reliability of the tool

The reliability of the questionnaire was established through a pilot study which involved 30 working women. Calculation of Cronbach's alpha for internal consistency was performed to assess the reliability of the questionnaire. The establishment of reliability not only enhanced the credibility of the questionnaire but also ensured that it is well- suited for its intended purpose.

a) Pre-testing

   Pretesting was conducted in a pilot study from randomly chosen 30 respondents.

b) Reliability of the Scales

   A test is reliable to the extent that it measures whatever it is measuring consistently. Among all the types of reliability, the researcher found the Average inter-item correlation method of testing reliability best suitable for the selected tool for the present study. Average inter-item correlation is a method of analysing internal consistency reliability. The average inter-item correlation for the present study was computed using Cronbach's Alpha.

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N-1) \cdot \bar{c}}$$

Where:

N = the number of items.

$\bar{c}$ = average covariance between item pairs.

$\bar{v}$ = average variance.

Table 2 : Overview of the Scale with reliability values

Scales	No of item	r - value
Knowledge scale for smart homes technology	33	0.89

The calculated value of the scale was 0.89 which makes the developed tool highly reliable.

3.9 Efficacy Assessment of Audio-Visual aid on Smart Homes Technology

An Audio-Visual was developed on various topics including IoT-based automation, centralized control systems, security enhancements, energy efficiency, and the impact of smart home devices on daily life in English language for better understanding and efficacy assessment of the same. The development and Audio-Visual aid of the training program was conducted in three stages.

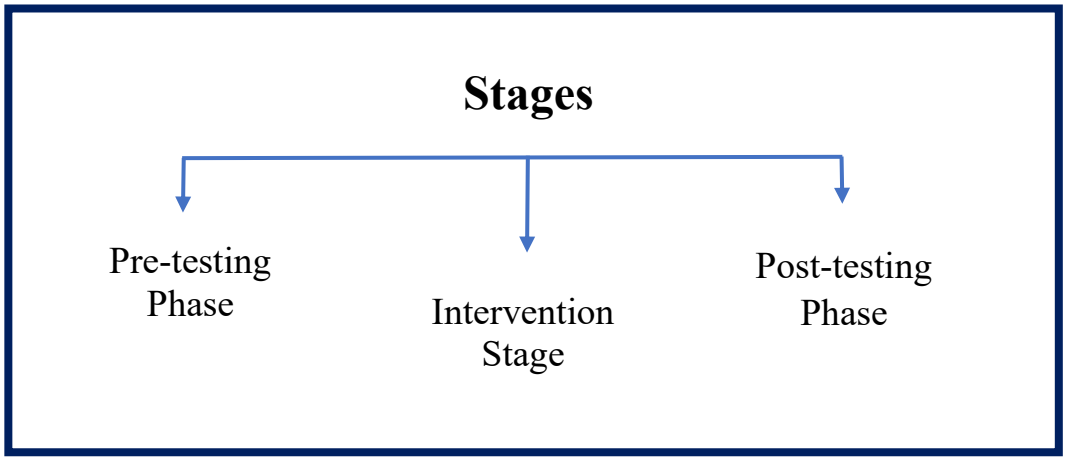


Figure 2: Stages of Audio-Visual aid

3.9.1 Pre-testing Phase – This phase comprised of synthesis of the information by the researcher in various topics related to Smart Homes Technology namely IoT-based automation, centralized control systems, security enhancements, energy efficiency, and the impact of smart home devices on daily life. The information was gathered from various sources. Content validity was established with the help of 5 experts from to the field of Family and Community Resource Management. For better understanding and creating interest an Audio - Visual aid it was prepared by the researcher in English. Before circulating the documentary, the Extent of knowledge of the respondents regarding Smart Homes Technology was assessed with the help of questionnaire to understand the existing knowledge that respondents possess regarding Smart Homes Technology after taking their consent.

Based on review of literature, the content for the video was carefully finalized to cover essential aspects of smart home systems. The video was designed to explain how smart home technology integrates advanced devices and automation to enhance comfort, security, energy efficiency, and convenience in residential spaces. Main focus included the role of IoT (Internet of Things) in connecting devices, the benefits of centralized control systems, and the functionality of automated appliances.

The content focused on simplifying complex ideas, ensuring that the audience could easily understand how smart homes operate and the value they bring to modern living. The visual components of the video were selected to align with the script and emphasize the topics discussed. All video clips included were sourced from Creative Commons platforms, ensuring they were legally available for use without copyright concerns. The clips were carefully sorted to visually demonstrate the integration of technology in daily life, such as automated lighting, smart security, and energy management systems. The platform used for developing this video was InVideo.

Transitions and animations were added to make the video more dynamic and visually appealing. Background music and voiceovers were incorporated to maintain engagement and clarity. This audio-visual aid was developed as a

knowledge-based tool, aiming to dearth between technical concepts and practical applications of smart home technology.

3.9.2. Intervention Phase – This phase comprised of imparting knowledge to the respondents regarding Smart Homes Technology on selected topics. Audio- Visual aid was used as a medium to impart knowledge regarding Smart Homes Technology. Audio-Visual aid allowed the researcher to translate complex ideas and facts into easy understanding of the respondents. Audio- Visual aid also allowed the researcher to generate interest among the respondents. The Audio-Visual aid was shared with the respondents using social media platforms.

3.9.3 Post-testing Phase – To assess the knowledge of the respondents regarding Smart homes technology, the questionnaire was distributed comprising of questions on assessing the knowledge of respondents regarding Smart Homes Technology. The data collected in pre testing phase helped in understanding the impact of the intervention programme. The same questionnaire was distributed after the circulation of Audio- visual aid to know whether the documentary helped in gaining an understanding of the knowledge gained by the respondents regarding Smart Homes Technology.

3.10 Data Collection

The data was collected by the researcher herself. The questionnaire was distributed to each respondent to collect information about of knowledge regarding Smart Homes Technology among working women before the circulation of Audio-Visual aid. After collecting the data, the developed video was shown regarding smart homes technology. After the Audio-Visual aid the questionnaire was again distributed to collect the data about knowledge regarding Smart Homes Technology among working women. The respondents were approached using their contact details. Their consent was taken and data was collected and all the queries were discussed through telephonic interviews.

3.11 Data Analysis

The procedure used to analyse the data of the present study were coding, tabulation, categorization, and statistical analysis. According to Best and khan (2006), the word statistics is sometimes used to describe the numerical data gathered. It describes a group of behaviours or characteristics abstracted from several individual observations

combined to generalize. Data were analysed and tables and graphs were prepared foe clear representation and simple understanding of Section I: Background information, Section II: Knowledge scale for "Smart Homes Technology" (will be administrated before circulation of Audio-Visual aid) and section III- Knowledge scale for "Smart Homes Technology" (will be administrated after circulation of Audio-Visual aid).

3.11.1 Categorization of Data

The following categories were made to enable researcher to analyse the data.

Section I: Demographic profile of the respondents

I. **Age (in years)**: It referred to the age of the respondents at the time of data collection. The obtained range of the age of the respondents based on equal intervals are as follows:
    1. 25-31 years
    2. 32-38 years
    3. 39-45 years

II. **Place:** It is referred to the place of the respondents where they live that was categorized as follows:

1. Vadodara
2. Ahmedabad
3. Surat

III. **Education:** It is referred to the education of the respondents that was categorized as follows:
    1. High School
    2. Diploma
    3. Graduate
    4. Post Graduate
    5. PhD

IV. **Type of Occupation:** It is referred to the occupation of the respondents that was categorized as follows:
    1. Service in Government Sector
    2. Service in Private sector
    3. Business

V. **Monthly Income (in Rupees ₹)** : It is referred to the monthly income of the respondents that was categorized as follows:
   1. 10,000 ₹– 30,000 ₹
   2. 30,001 ₹– 80,000 ₹
   3. 80,001/ ₹ and above

VI. **Marital status:** It is referred to the marital status that of the respondents that was categorized as follows:
   1. Single
   2. Married
   3. Separated
   4. Divorced

VII. **Type of family:** It is referred to the Type of family of the respondents that was categorized as follows:
   1. Nuclear
   2. Joint

VIII. **Number of Total Family Members:** It is referred to the Total number of family members of the respondents that was categorized as follows:
   1. 1-3
   2. 4-7
   3. 8-10

IX. **Number of earning members in the Family:** It is referred to the number of earning members in the family of the respondents which was categorized as follows:
   1. 1-3
   2. 4-5

X. **Type of House:** It is referred to the type of house of the respondents in which they are currently living was categorized as follows:
   1. Apartment
   2. Duplex
   3. Tenement
   4. Bungalow

XI. **Total list of Smart Home devices / appliances at home:** It referred to the total list of Smart Home devices / appliances at home:

1. 0-3

2. 4-7
3. 8-11

XII. Ownership of Smart Home voice assistance: It is referred to the type of Smart Home voice assistance respondents own:

1. Alexa
2. Google assistant
3. Apple assistant
4. Any other _____
5. None of the above

Section II & III: Extent of Knowledge regarding "Smart Homes Technology" among working women

To find out the Extent of knowledge regarding Smart Homes Technology among working women, a scale of 33 statements were developed. The responses were taken in three-point scale (Likert scale) "Agree", "Undecided", "Disagree" and the scores of 3,2,1 were ascribed respectively. The scores of each of the item of the scale were summated and the possible range of each of the maximum scores were divided into three categories having equal intervals which were 'Low Extent of knowledge', 'Moderate Extent of knowledge' and 'High Extent of knowledge'. The minimum scores was 33 and the maximum score was 99. Higher scores represented a high level of knowledge regarding Smart Homes Technology among working women.

Table 3: Categorization and Range of scores for Extent of Knowledge regarding Smart Homes Technology among working women

Sr. No.	Extent of Knowledge regarding Smart Homes Technology among Working Women	Score Range
1	Low Extent of Knowledge	33-54
2	Moderate Extent of Knowledge	55-77
3	High Extent of Knowledge	78-99

3.11.2 Weighted mean score

The weighted mean is a type of mean that is calculated by multiplying the score (or probability) associated with a particular statement.

$$W = \frac{\sum_{i=1}^{n} w_i X_i}{\sum_{i=1}^{n} w_i}$$

Where, W is weighted average, n = number of terms to be averaged, w_i = weights applied to x values and Xi = data values to be averaged.

Coding

The categories of data are often converted into scores that are tabulated and totalled at this point through a coding operation. This data from every area of a questionnaire was entered into an excel sheet after each response was assigned a score.

Tabulation

The technical process of tabulation involves organizing the classification data into tables. To provide a clear image of the findings, the data was converted in tabular form.

Statistical analysis

The data was analysed employing descriptive as well as relational statistics.

Descriptive statistics

The data were presented in frequencies, percentage, mean and standard deviation (f, %, μ, SD).

Relational statistics

t-test were carried out to test the hypotheses postulated for the study.

Table 4: Relational Statistics applied to test the Hypotheses

Test	Dependent Variables
t-test	**Dependent Variable:** Knowledge regarding Smart Homes Technology before and after circulation of Audio-Visual Aid

FINDINGS AND DISCUSSION

CHAPTER IV

FINDINGS AND DISCUSSION

The findings of the present research are described and discussed in this chapter. The findings are analysed and presented in the form of tables and graphical representations. For the systematic presentation of the results, the chapter has been divided into the following sections:

Section I 4.1 Demographic profile of the respondents

Section II 4.2 Development of Audio-Visual aid (documentary)

Section III 4.3 Efficacy of Audio-Visual aid on Smart Homes Technology among working women

Section V 4.5 Testing of Hypotheses

4.1 Demographic profile of the Respondents

Through demographic study, the basic conditions of a people regarding; social, political and economic aspects are explained. Demographics are statistics that describe respondent and give a better understanding of their background characteristics. A demographic profile in a survey allows researchers to gain background information on their participants and provide context for collected survey data, allowing researchers to describe their participants and analyse the data better.

This section presents demographic information of the respondents under the present study, which included parameters like; Age (in years), Place, Type of Education, Type of Occupation, Monthly Income (in rupees ₹), Marital Status, Type of family, Number of Total Family Members, Number of Earning Members in the Family, Type of House, Total list of Smart Household Devices / Appliances at Home, Ownership of Smart Homes Assistance.

The section below contains information regarding Age (in years), Place, Type of Education, Type of Occupation, Monthly Income (in rupees₹) of the respondents.

Table 5: Frequency and percentage distribution of the respondents according to their personal Information

Sr. No.	**Age (in years)**	***f***	***%***
1.	24-31 years	24	33.31
2.	32-38 years	71	47.34
3.	39-45 years	55	36.66
	Total	150	
	Mean	33.31	
	Standard Deviation (S.D)	6.18	
Sr. No.	**Place**	***f***	***%***
1.	Vadodara	46	30.67
2.	Ahmedabad	67	44.67
3.	Surat	37	24.66
	Total	150	

Sr. No.	Type of Education	*f*	*%*
1.	High School	1	0.67
2.	Diploma	2	1.33
3.	Graduation	68	45.33
4.	Post Graduation	78	52
5.	PhD	1	0.67
	Total	150	
Sr. No.	**Type of Occupation**	*f*	*%*
1.	Service in Government Sector	34	22.67
2.	Service in Private Sector	97	64.67
3.	Business	19	12.66
	Total	150	
Sr. No.	**Monthly Income (in Rupees₹)**	*f*	*%*
4.	₹10,000 to ₹30,000	76	50.66
5.	₹30,001 to ₹80,000	72	48
6.	₹80,001 and above	2	1.34
	Total	150	
	Mean	39258.38	
	Standard Deviation (S.D)	36558.41	

Age

The age of the respondents ranged between 24 to 45 years at the time of data collection. The mean age of the respondents was 33.31 years, with a standard deviation of 6.18. The data revealed that 16 per cent of the respondents belonged to the age group of 24 to 31 years. Around 47.34 per cent of the respondents were in the age group of 32 to 38 years. And 36.66 per cent of respondents belonged to the age group of 39 to 45 years (Table 5 and Figure 3).

Place

The data revealed that (Table 5 and Figure 3) 30.67 per cent of the respondents were living in Vadodara city, 44.66 per cent of the respondents were living in Ahmedabad city and 24.66 per cent of the respondents were living in Surat city.

Education Qualification

The data collected on Educational Qualification of the respondents, revealed that (Table 5 and Figure 3) 0.67 per cent of the respondents completed their high school, 1.33 percent of the respondents completed their diploma degree, 45.33 per cent of the respondents were graduate, 52 per cent of the respondents were post graduate, 0.67 per cent of the respondents holds doctorate degree.

Type of Occupation

The data collected on type of occupation, revealed that (Table 5 and Figure 3) 22.67 per cent of the respondents were working in Government sector, 64.67 per cent of the respondents were working in Private sector and 12.66 per cent of the respondents were having their own business.

Monthly Income

The data collected on Monthly Income of the respondents, revealed that (Table 5 and Figure 3) 50.66 per cent of the respondents have their monthly income ranging between 10,000 to 30,000 rupees, 48 per cent of the respondents have their monthly income ranging between 31,000 to 80,000 rupees and 1.34 per cent of the respondents have their monthly income ranging between 81,000 and above. The mean monthly income was found to be 39258.38 rupees with the standard deviation of 36558.41.

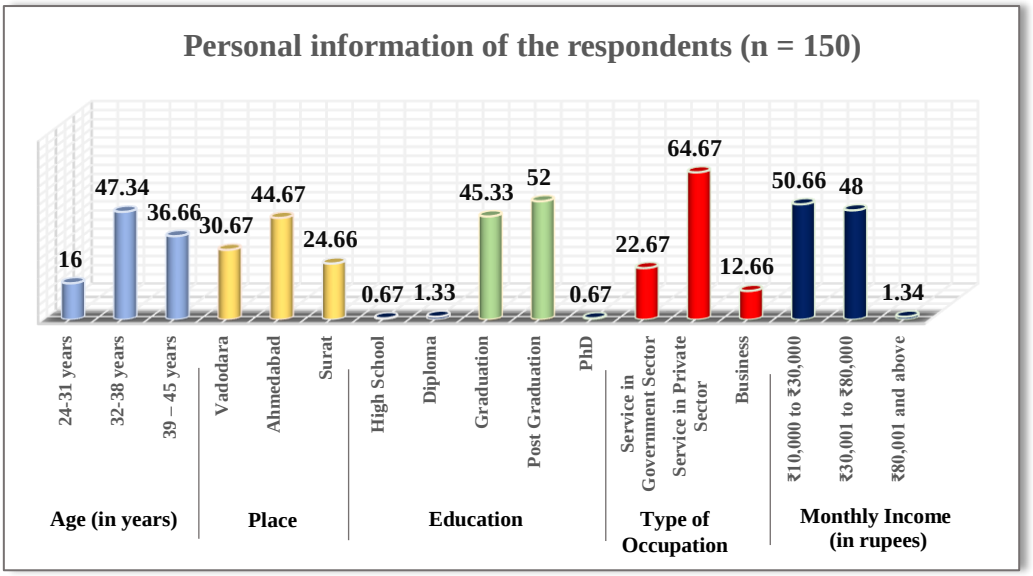


Figure 3: Percentage distribution of the respondents according to their personal information

The section below contains information regarding Type of family, Number of Total Family Members, Number of Earning Members in the Family and Type of House of the respondents.

Table 6: Frequency and percentage distribution of the respondents according to their Family Information

Sr. No.	**Marital Status**	***f***	***%***
1.	Single	26	17.34
2.	Married	111	74
3.	Separated	8	5.33
4.	Divorced	5	3.33
	Total	150	
Sr. No.	**Type of Family**	***f***	***%***
1.	Nuclear	99	66
2.	Joint	51	34
	Total	150	
Sr. No.	**Number of Total Family Members**	***f***	***%***
1.	1-3	54	36
2.	4-7	90	60
3.	8-10	6	4
	Total	150	
Sr. No.	**Number of Earning Members in the Family**	***f***	***%***
1.	1-3	139	92.66
2.	4-5	11	7.34
	Total	150	
Sr. No.	**Type of House**	***f***	***%***
1.	Apartment	54	36
2.	Duplex	38	25.33
3.	Tenement	37	24.67
4.	Bungalow	21	14
	Total	150	

Marital Status

The data collected on Marital Status of the respondents, revealed that (Table 6 and Figure 4) 17.34 per cent of the respondents were single, 74 per cent of the responses were married, 5.33 per cent of the responses were separated and 3.33 per cent of the respondents were divorced.

Type of Family

The data collected on Type of family of the respondents, revealed that (Table 6 and Figure 4) 66 per cent of the respondents were living in nuclear family and 44 per cent of the respondents were living in joint family.

Total number of Family members

The data collected on Total number of family members of the respondents, revealed that (Table 6 and Figure 4) 36 per cent of the respondents have 1-3 number of members in their family and 60 per cent of the respondents had 4-7 number of family members and 4 per cent of respondents have 8-10 number of family members.

Total number of Earning members

The data collected on Total number of earning members in family of the respondents, revealed that (Table 6 and Figure 4) had 92.66 per cent of the respondents have 1-3 earning members in their family and 7.34 per cent of the respondents had 4-5 earning members in their family.

Type of House

The data collected on Type of house of the respondents, revealed that (Table 6 and Figure 4) 36 per cent of the respondents were living in an Apartment, 25.33 per cent of the respondents were living in a Duplex, 24.67 per cent of the respondents were living in a Tenement and 14 per cent of the respondents were living in a Bungalow.

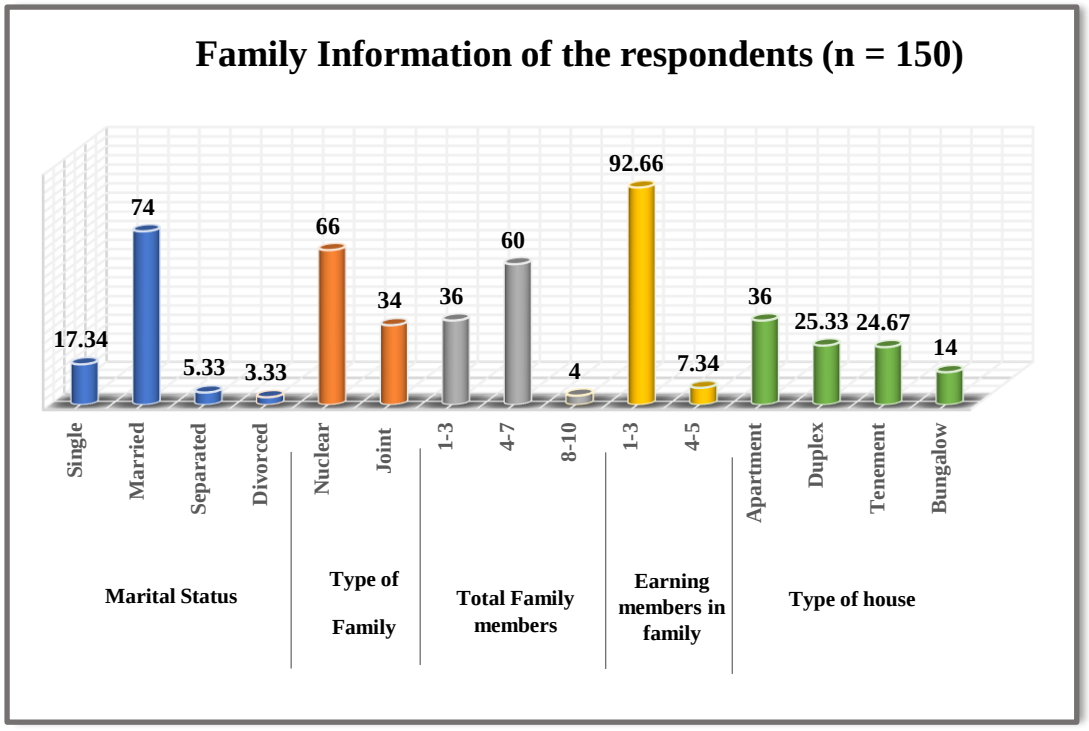


Figure 4: Percentage distribution of the respondents according to their family information

The section below contains information regarding Total number of Smart Home Devices/Appliances at home and Smart Home assistance do they own of the respondents.

Total number of Smart Home Devices/Appliances at home

The data collected on Total number of smart home devices/appliances at home, revealed that (Table 7 and Figure 5) had 34.67 per cent of the respondents have 0-3 smart home Appliances/Devices at their home, 55.33 per cent of the respondents have 4-7 smart home Appliances/Devices at their home and 10 per cent of the respondents have 8-11 Smart Home Appliances/Devices at their home.

Smart Home assistance do they own

The data collected on the Smart Home assistance do they own, revealed that (Table 7 and Figure 5) 46.67 per cent of the respondents had Google assistant at their home, 20.66 per cent of the respondents had Apple assistant at their home, 32 per cent of the respondents had Alexa at their home and 14 per cent of the respondents does not have any assistance at their home.

Table 7: Frequency and percentage distribution of the respondents according to their Smart Homes

Sr. No.	Total list of Smart Home devices/appliances at home	*f*	*%*
1.	0-3	52	34.67
2.	4-7	83	55.33
3.	8-11	15	10
	Total	150	
Sr. No.	**Which of the Smart Home assistance do you own**	*f*	*%*
1.	Google Assistant	70	46.67
2.	Apple Assistant	31	20.66
3.	Alexa	48	32
4.	None of the above	21	14
	Total	150	

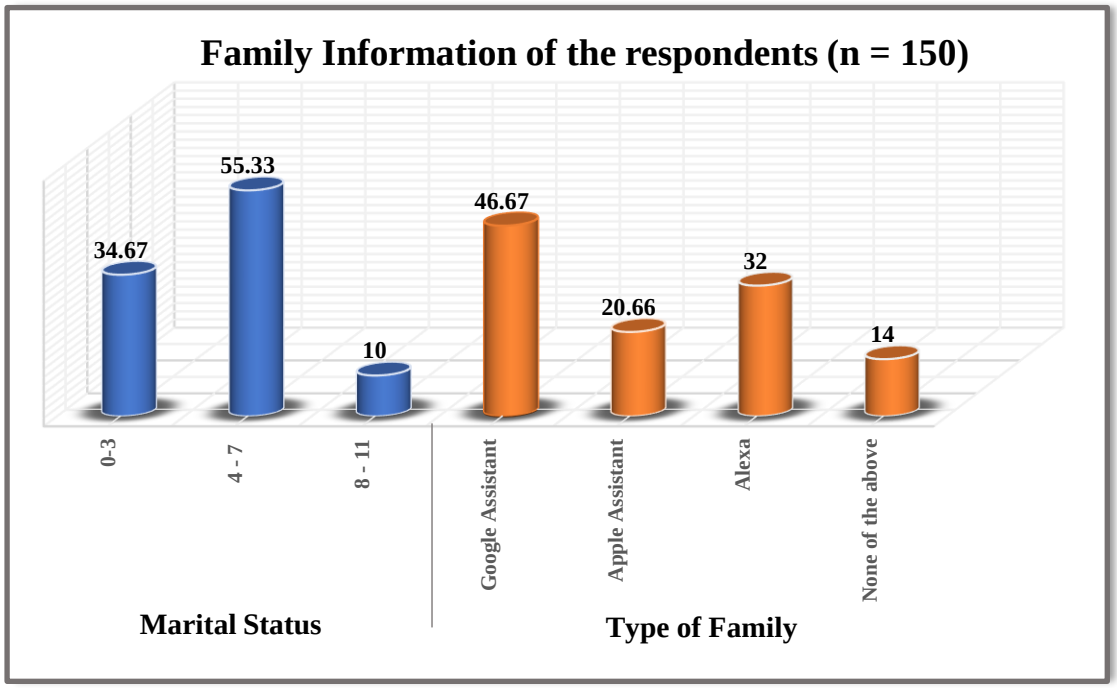


Figure 5: Percentage distribution of the respondents according to their Smart Homes

Section II

4.2 Development of Audio-Visual aid (documentary)

One of the major objectives of the present research was to develop an audio-visual aid on smart home technology specifically designed for working women. The goal was to create an engaging and easy-to-understand documentary that demonstrates how smart home devices can simplify daily tasks, enhance security, and improve energy efficiency. To achieve this, an AI-powered software called Invidio was used to automate the creation process, making the video development faster and more efficient.

The use of AI in Invidio helped generate voiceovers, animations, and video editing with minimal manual effort. AI-assisted scripting provided natural-sounding narration, while smart video templates allowed for quick assembly of visual elements like images, transitions, and text overlays. Additionally, AI-driven motion graphics and automated subtitles improved accessibility, ensuring that working women could easily understand smart home features without technical complexity. This approach saved time and effort, making the content visually appealing, informative, and easy to grasp.

4.2.1 Content used for making Audio Visual aid (documentary)

Creating a video on smart home technology with a maximum length of 5 minutes can effectively deliver a concise yet comprehensive overview. For better understanding, the documentary was divided into following 1-9 sections:

Title of Documentary: Smart Home Technology

I. Introduction

This section elaborated upon how technology is revolutionizing our living spaces, making homes smarter, safer, and more efficient.

II. Smart Homes Technology

This section elaborated upon the basic definition and meaning of Smart Homes Technology.

III. Key Components of Smart Homes

This section Focuses on the key components of smart homes technology such as smart thermostats, smart lighting, smart locks, smart security cameras and smart speakers.

IV. Smart homes are built around several key technologies:

This section focuses on the key technologies that are built around smart homes technology such as smart thermostats, smart lighting, smart locks, smart security cameras and smart home assistants.

V. How Smart Homes Work

This section elaborates upon how the smart homes work and which smart home devices do we need to communicate which manages all the devices through a single platform.

VI. Benefits of Smart Homes

This section elaborates upon Benefits of smart home such as convenience, Energy efficiency, Security and Personalisation.

VII. Security Concerns & Solutions

This section highlights the cybersecurity risks associated with smart homes, emphasizing the vulnerability of connected devices to hacking. It provides key security measures, such as using strong passwords, keeping devices updated, and securing the home network with encryption, to enhance protection against potential threats.

VIII. Future of Smart Homes

This section explores the future of smart homes, focusing on advancements such as AI-driven automation for predictive and adaptive control, sustainability features like smart energy grids and water management, and integrated health monitoring devices to enhance care for seniors and individuals with medical needs.

IX. Conclusion The conclusion highlights how smart home technology enhances daily life by improving convenience, efficiency, and security. As advancements continue, homes will become more intelligent, interconnected, and adaptive to user needs.

Time Lapse- 2:28

Time Lapse- 1:29

Time Lapse- 0:55

Time Lapse- 0:30

Time Lapse- 1:55

Time Lapse-2:17

Plate: 37 Screenshots of Developed Audio-visual aid on Smart Homes Technology

Section III

4.3 Extent of knowledge regarding smart homes technology for working women

4.3.1 Extent of knowledge regarding Smart Homes Technology before the circulation of Audio-Visual aid (Pre-test phase)

A. Comfort and lifestyle

1. The data (Table 8 & Figure 6) indicated that 42.67 per cent of the respondents agreed that, Smart homes provides comfortable lifestyle to their occupants, while 10.66 per cent respondents were undecided and 46.67 per cent of the respondents were disagree.
2. The data (Table 8 & Figure 6) indicated that 39.33 per cent of the respondents agreed that, Smart homes offers a better quality of life by introducing automated assistive services, while 21.34 per cent respondents were undecided and 39.33 per cent of the respondents were disagree.
3. The data (Table 8 & Figure 6) indicated that 27.37 per cent of the respondents agreed that, Smart homes provides fully controlled lifestyle to their occupants. while 30 per cent respondents were undecided and 42.66 per cent of the respondents were disagree.
4. The data (Table 8 & Figure 6) indicated that 28 per cent of the respondents agreed that, Smart homes offers a better quality of life by introducing automated appliance control. while 27.37 per cent respondents were undecided and 44.66 per cent of the respondents were disagree.

B. Automation and control

1. The data (Table 9 & Figure 7) indicated that 27.33 per cent of the respondents agreed that, Smart home technologies allow automation routines, such as turning off all lights and locking doors when the user leaves the house while 27.33 per cent respondents were undecided and 45.34 per cent of the respondents were disagree.
2. The data (Table 9 & Figure 7) indicated that 32 per cent of the respondents agreed that, Smart home devices learn user preferences over time, optimizing settings for comfort and convenience automatically. while 22 per cent respondents were undecided and 46 per cent of the respondents were disagree.

3. The data (Table 9 & Figure 7) indicated that 33.33 per cent of the respondents agreed that, A user can control home appliances and devices remotely, which enables him/her to execute tasks before arriving home. while 21.33 per cent respondents were undecided and 45.34 per cent of the respondents were disagree.
4. The data (Table 9 & Figure 7) indicated that 30 per cent of the respondents agreed that, Smart home devices are controlled remotely via smartphone applications. while 22.66 per cent respondents were undecided and 47.34 per cent of the respondents were disagree.

C. Accessibility and Assistive Technology

1. The data (Table 10 & Figure 8) indicated that 33.33 per cent of the respondents agreed that, Smart home technology improves accessibility by allowing users with disabilities to control home device through voice commands or mobile apps. while 19.33 per cent respondents were undecided and 47.34 per cent of the respondents were disagree.
2. The data (Table 10 & Figure 8) indicated that 33.34 per cent of the respondents agreed that Voice assistants like Amazon Alexa and Google Assistant can be integrated into smart home systems to control devices using voice commands. while 21.33 per cent respondents were undecided and 45.33 per cent of the respondents were disagree.

D. Internet and Connectivity

1. The data (Table 11 & Figure 9) indicated that 33.33 per cent of the respondents agreed that, All smart home devices require a constant internet connection to function properly while 20.67 per cent respondents were undecided and 46 per cent of the respondents were disagree.
2. The data (Table 11 & Figure 9) indicated that 30.67 per cent of the respondents agreed that, Smart home systems are set up to control multiple devices from a single platform, providing a unified user experience. While 22 per cent respondents were undecided and 47.33 per cent of the respondents were disagree.
3. The data (Table 11 & Figure 9) indicated that 31.34 per cent of the respondents agreed that Once smart devices are connected, they often share data among

themselves so that they work together. while 20 per cent respondents were undecided and 48.66 per cent of the respondents were disagree.

E. Smart Homes components and technology

1. The data (Table 12 & Figure 10) indicated that 33.34 per cent of the respondents agreed that, Smart home is residence equipped with technologies that include sensors. while 18 per cent respondents were undecided and 48.66 per cent of the respondents were disagree.
2. The data (Table 12 & Figure 10) indicated that 32 per cent of the respondents agreed that Smart home is residence equipped with technologies that include wired and wireless networks. while 20.67 per cent respondents were undecided and 47.33 per cent of the respondents were disagree.
3. The data (Table 12 & Figure 10) indicated that 34 per cent of the respondents agreed that Smart home is a residence equipped with technologies that include actuators and intelligent systems. while 22 per cent respondents were undecided and 44 per cent of the respondents were disagree.
4. The data (Table 12 & Figure 10) indicated that 31.34 per cent of the respondents agreed that Artificial intelligence technology is also used in smart home appliances. while 20.66 per cent respondents were undecided and 48 per cent of the respondents were disagree.

F. Safety and Security

1. The data (Table 13 & Figure 11) indicated that 32 per cent of the respondents agreed that, Smart home security systems include cameras, motion sensors, and door/window sensors that provide real-time alerts to users. while 22 per cent respondents were undecided and 46 per cent of the respondents were disagree.
2. The data (Table 13 & Figure 11) indicated that 34.67 per cent of the respondents agreed that Smart homes provides secure lifestyle to their occupants. While 20.67 per cent respondents were undecided and 44.66 per cent of the respondents were disagree.
3. The data (Table 13 & Figure 11) indicated that 29.34 per cent of the respondents agreed that Smart home technologies enhances security by providing remote access to live video feeds and allowing users to lock/unlock doors from a distant

location. while 26 per cent respondents were undecided and 44.66 per cent of the respondents were disagree.

4. The data (Table 13 & Figure 11) indicated that 33.33 per cent of the respondents agreed that Smart smoke detectors and carbon monoxide detectors send alerts to smartphones in case of an emergency, even when users are away from home. While 21.34 per cent respondents were undecided and 45.33 per cent of the respondents were disagree.

G. Smart Appliances

1. The data (Table 14 & Figure 12) indicated that slightly more than one fourth 31.34 per cent of the respondents agreed that Smart appliances, such as refrigerators and washing machines, provides notifications about maintenance. while 22 per cent respondents were undecided and 46.66 per cent of the respondents were disagree.
2. The data (Table 14 & Figure 12) indicated that 26.66 per cent of the respondents agreed that Smart appliances, such as refrigerators and washing machines, provides notifications about energy usage. While 29.34 per cent respondents were undecided and 44 per cent of the respondents were disagree.
3. The data (Table 14 & Figure 12) indicated that 30 per cent of the respondents agreed that Smart lighting systems can be programmed to turn on and off automatically based on occupancy and time of day. while 19.34 per cent respondents were undecided and 50.66 per cent of the respondents were disagree.

H. Smart Lighting and climate control

1. The data (Table 15 & Figure 13) indicated that 26.66 per cent of the respondents agreed that, Smart thermostats is controlled remotely via smartphone apps, allowing users to adjust the temperature from anywhere. while 22 per cent respondents were undecided and 51.34 per cent of the respondents were disagree.
2. The data (Table 15 & Figure 13) indicated that 31.34 per cent of the respondents agreed that Smart lighting systems can be programmed to turn on and off automatically based on occupancy and time of day. while 24.66 per cent respondents were undecided and 44 per cent of the respondents were disagree.

3. The data (Table 15 & Figure 13) indicated that 36.66 per cent of the respondents agreed that Smart lighting systems adjusts colour temperature and brightness based on natural light levels and user preferences, enhancing the ambiance. while 16 per cent respondents were undecided and 47.34 per cent of the respondents were disagree.

I. Energy efficiency and Sustainability

1. The data (Table 16 & Figure 14) indicated that 28.66 per cent of the respondents agreed that Smart appliances aim to reduce energy waste. while 25.34 per cent respondents were undecided and 46 per cent of the respondents were disagree.
2. The data (Table 16 & Figure 14) indicated that 29.34 per cent of the respondents agreed that Smart appliances aim to improve the usability of energy for users. While 22 per cent respondents were undecided and 48.66 per cent of the respondents were disagree.
3. The data (Table 16 & Figure 14) indicated that 31.34 per cent of the respondents agreed that Smart home energy monitoring tools track electricity consumption. while 22 per cent respondents were undecided and 46.66 per cent of the respondents were disagree.
4. The data (Table 16 & Figure 14) indicated that 34 per cent of the respondents agreed that Smart home energy monitoring tools can help identify ways to reduce energy use and save money. While 17.34 per cent respondents were undecided and 48.66 per cent of the respondents were disagree.
5. The data (Table 16 & Figure 14) indicated that 28.66 per cent of the respondents agreed that Smart home technologies, like solar panels and battery storage systems, generates and store renewable energy, potentially lowering utility bills. while 25.34 per cent respondents were undecided and 46 per cent of the respondents were disagree.
6. The data (Table 16 & Figure 14) indicated that 33.34 per cent of the respondents agreed that Smart irrigation systems can adjust watering schedules based on weather forecasts and soil moisture levels to conserve water. while 20 per cent respondents were undecided and 46.66 per cent of the respondents were disagree.

4.3.2 Efficacy of Audio-Visual aid developed on smart homes technology among working women

Table 8: Frequency and percentage distribution of respondents according to the Efficacy of Audio-Visual aid developed on Smart Homes Technology among working women regarding Comfort and Lifestyle in Pre Test and Post Test.

Sr. No.	Statements regarding Comfort and Lifestyle	Pre Test (n=150)						Weighted mean Score	Post Test (n=150)						Weighted mean Score
		Agree		Undecided		Disagree			Agree		Undecided		Disagree		
		f	%	*f*	%	*f*	%		*f*	%	*f*	%	*f*	%	
1.	Smart homes provides comfortable lifestyle to their occupants.	64	42.67	16	10.66	70	46.67	1.96	108	72	14	9.34	28	18.66	2.53
2.	Smart homes offers a better quality of life by introducing automated assistive services.	59	39.33	32	21.34	59	39.33	2	100	66.66	24	17.34	26	16	2.50
3.	Smart homes provides fully controlled lifestyle to their occupants.	41	27.37	45	30	64	42.66	1.84	99	66	31	20.66	20	13.34	2.52
4.	Smart homes offers a better quality of life by introducing automated appliance control.	42	28	67	27.37	41	44.66	1.83	100	66.66	19	20.67	31	12.67	2.54
							Total	**7.63**						**Total**	**10.09**

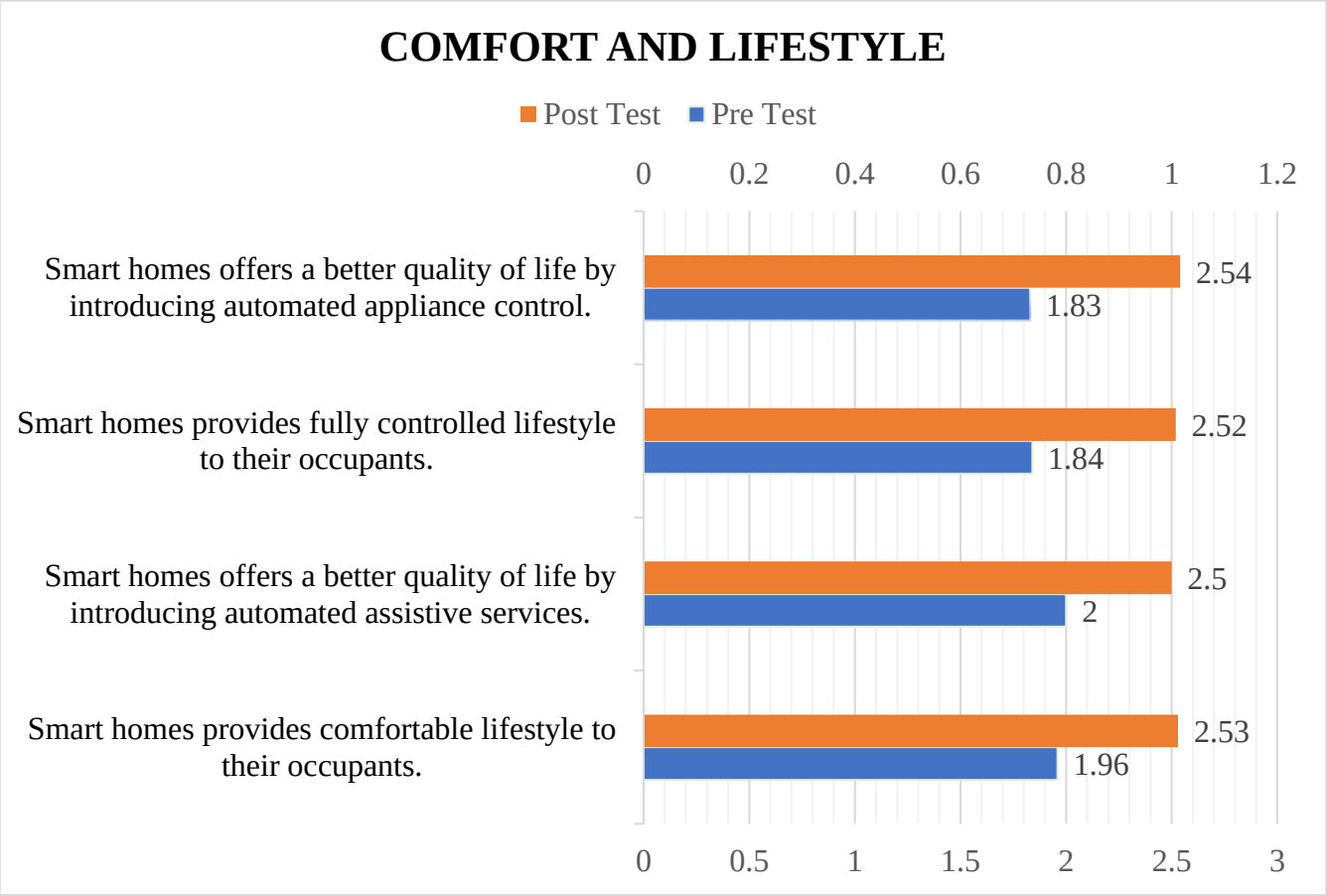


Figure 6: Weighted Mean Scores of Pre and Post-Test Knowledge Scale on "Smart Home Technology, Comfort and Lifestyle" Among Working Women Before and After the Circulation of the Audio-Visual Aid

Table 9: Frequency and percentage distribution of respondents according to the Efficacy of Audio-Visual aid developed on Smart Homes Technology among working women regarding Automation and Control in Pre Test and Post Test.

Sr. No.	Statements regarding Automation and Control	Pre Test (n=150)						Weighted mean Score	Post Test (n=150)						Weighted mean Score
		Agree		Undecided		Disagree			Agree		Undecided		Disagree		
		f	%	*f*	%	*f*	%		*f*	%	*f*	%	*f*	%	
1.	Smart home technologies allow automation routines, such as turning off all lights and locking doors when the user leaves the house.	41	27.33	41	27.33	68	45.34	1.82	97	64.6	39	26	14	9.34	2.55
2.	Smart home devices learn user preferences over time, optimizing settings for comfort and convenience automatically.	48	32	33	22	69	46	1.86	102	8.66	35	23.34	13	8.66	2.59
3.	A user can control home appliances and devices remotely, which enables him/her to execute tasks before arriving home.	50	33.33	32	21.33	68	45.34	1.88	103	68.66	32	21.34	15	10	2.58
4.	Smart home devices are controlled remotely via smartphone applications.	45	30	34	22.66	71	47.34	1.82	103	68.66	29	19.34	18	12	2.56
							Total	**7.38**				**Total**			**10.28**

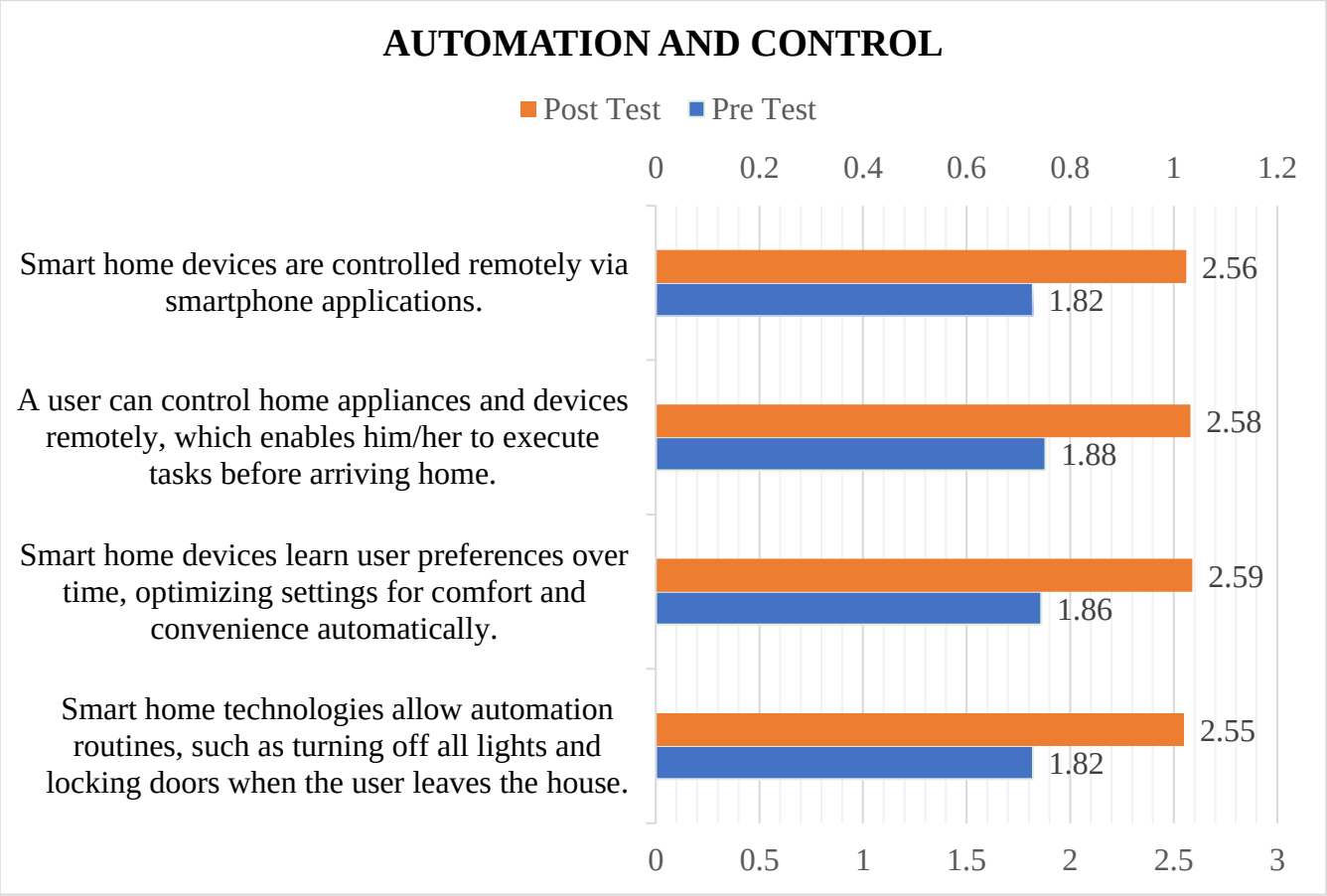


Figure 7: Weighted Mean Scores of Pre and Post-Test Knowledge Scale on "Smart Home Technology, Automation and Control " Among Working Women Before and After the Circulation of the Audio-Visual Aid

Table 10: Frequency and percentage distribution of respondents according to the Efficacy of Audio-Visual aid developed on Smart Homes Technology among working women regarding Accessibility and Assistive Technology in Pre Test and Post Test.

Sr. No.	Statements regarding Accessibility and Assistive Technology	Pre Test (n=150)						Weighted mean Score	Post Test (n=150)						Weighted mean Score
		Agree		Undecided		Disagree			Agree		Undecided		Disagree		
		f	%	*f*	%	*f*	%		*f*	%	*f*	%	*f*	%	
1.	Smart home technology improves accessibility by allowing users with disabilities to control home device through voice commands or mobile apps.	50	33.33	29	19.33	71	47.34	1.86	103	68.66	32	21.34	15	10	2.58
2.	Voice assistants like Amazon Alexa and Google Assistant can be integrated into smart home systems to control devices using voice commands.	50	33.34	32	21.33	68	45.33	1.88	95	63.34	28	18.66	27	18	2.45
							Total	**3.74**						**Total**	**5.03**

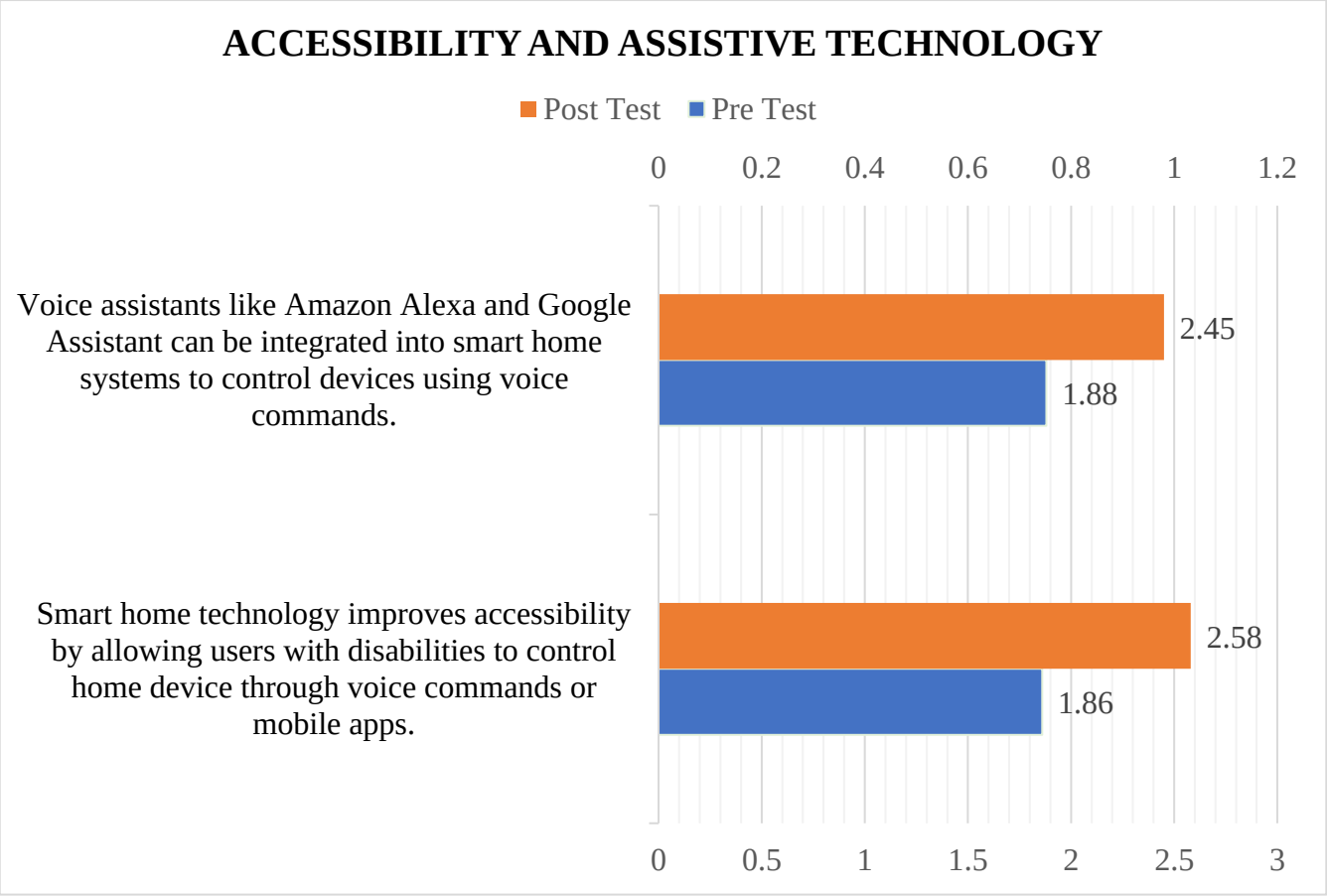


Figure 8: Weighted Mean Scores of Pre- and Post-Test Knowledge Scale on "Smart Home Technology, Accessibility and Assistive Technology " Among Working Women Before and After the Circulation of the Audio-Visual Aid

Table 11: Frequency and percentage distribution of respondents according to the Efficacy of Audio-Visual aid developed on Smart Homes Technology among working women regarding Internet and Connectivity in Pre Test and Post Test.

Sr. No.	Statements regarding Internet and Connectivity	Pre Test (n=150)						Weighted mean Score	Post Test (n=150)						Weighted mean Score
		Agree		Undecided		Disagree			Agree		Undecided		Disagree		
		f	%	*f*	%	*f*	%		*f*	%	*f*	%	*f*	%	
1.	All smart home devices require a constant internet connection to function properly.	50	33.33	31	20.67	69	46	1.87	108	72	20	13.34	22	14.66	2.57
2.	Smart home systems are set up to control multiple devices from a single platform, providing a unified user experience.	46	30.67	33	22	71	47.33	1.83	100	66.66	31	20.67	19	12.67	2.54
3.	Once smart devices are connected, they often share data among themselves so that they work together.	47	31.34	30	20	73	48.66	1.82	98	65.33	35	23.34	17	11.33	2.54
							Total	**5.52**						**Total**	**7.65**

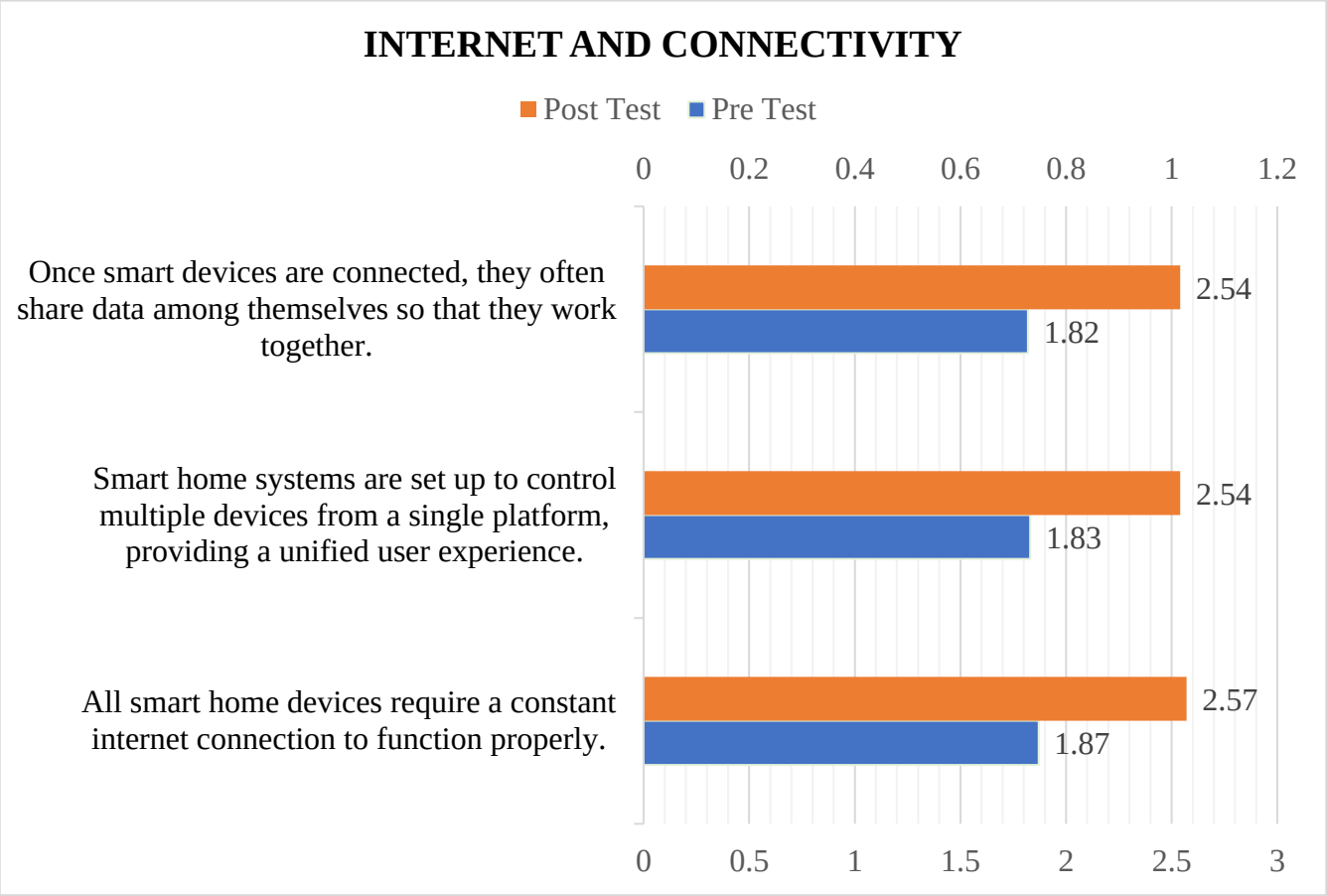


Figure 9: Weighted Mean Scores of Pre- and Post-Test Knowledge Scale on "Smart Home Technology,Internet and Connectivity " Among Working Women Before and After the Circulation of the Audio-Visual Aid

Table 12: Frequency and percentage distribution of respondents according to the Efficacy of Audio-Visual aid developed on Smart Homes Technology among working women regarding Smart Home Components and Technologies in Pre Test and Post Test.

Sr. No.	Statements regarding Smart Home Components and Technologies	Pre Test (n=150)						Weighted mean Score	Post Test (n=150)						Weighted mean Score
		Agree		Undecided		Disagree			Agree		Undecided		Disagree		
		f	%	*f*	%	*f*	%		*f*	%	*f*	%	*f*	%	
1.	Smart home is residence equipped with technologies that include sensors.	50	33.34	27	18	73	48.66	1.84	97	64.66	33	22	20	13.34	2.51
2.	Smart home is residence equipped with technologies that include wired and wireless networks.	48	32	31	20.67	71	47.33	1.84	101	67.34	28	18.66	21	14	2.53
3.	Smart home is a residence equipped with technologies that include actuators and intelligent systems.	51	34	33	22	66	44	1.9	99	66	32	21.34	19	12.66	2.53
4.	Artificial Intelligence technology is also used in smart home appliances.	47	31.34	31	20.66	72	48	1.33	102	68	31	20.66	17	11.34	2.56
							Total	**6.91**						**Total**	**10.13**

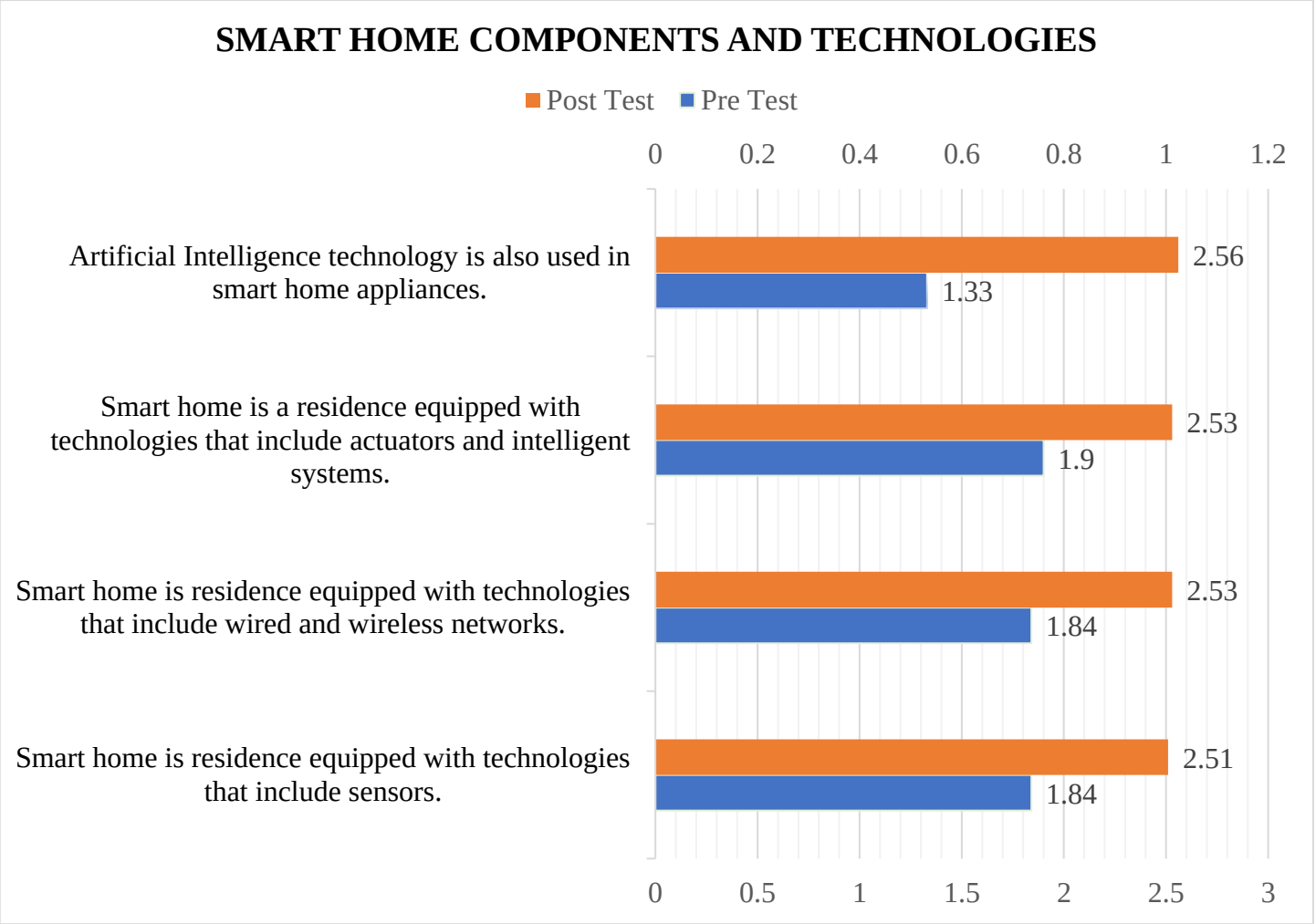


Figure 10: Weighted Mean Scores of Pre- and Post-Test Knowledge Scale on "Smart Home Technology, Smart Home Components and Technologies " Among Working Women Before and After the Circulation of the Audio-Visual Aid

Table 13: Frequency and percentage distribution of respondents according to the Efficacy of Audio-Visual aid developed on Smart Homes Technology among working women regarding Safety and Security in Pre Test and Post Test.

Sr. No.	Statements regarding Safety and Security	Pre Test (n=150)						Weighted mean Score	Post Test (n=150)						Weighted mean Score
		Agree		Undecided		Disagree			Agree		Undecided		Disagree		
		f	%	*f*	%	*f*	%		*f*	%	*f*	%	*f*	%	
1.	Smart home security systems include cameras, motion sensors, and door/window sensors that provide real-time alerts to users.	48	32	33	22	69	46	1.86	94	62.66	35	23.34	21	14	2.48
2.	Smart homes provides secure lifestyle to their occupants.	52	34.67	31	20.67	67	44.66	1.9	102	68	29	19.34	19	12.66	2.55
3.	Smart homes technology enhances security by providing remote access to live video feeds and allowing users to lock/unlock doors from a distant location.	44	29.34	39	26	67	44.66	1.84	98	65.34	37	24.66	15	10	2.55

4.	Smart smoke detectors and carbon monoxide detectors send alerts to smartphones in case of an emergency, even when users are away from home.	50	33.33	32	21.34	68	45.33	1.88	103	68.66	27	18	20	13.33	2.55
							Total	**7.48**						**Total**	**10.13**

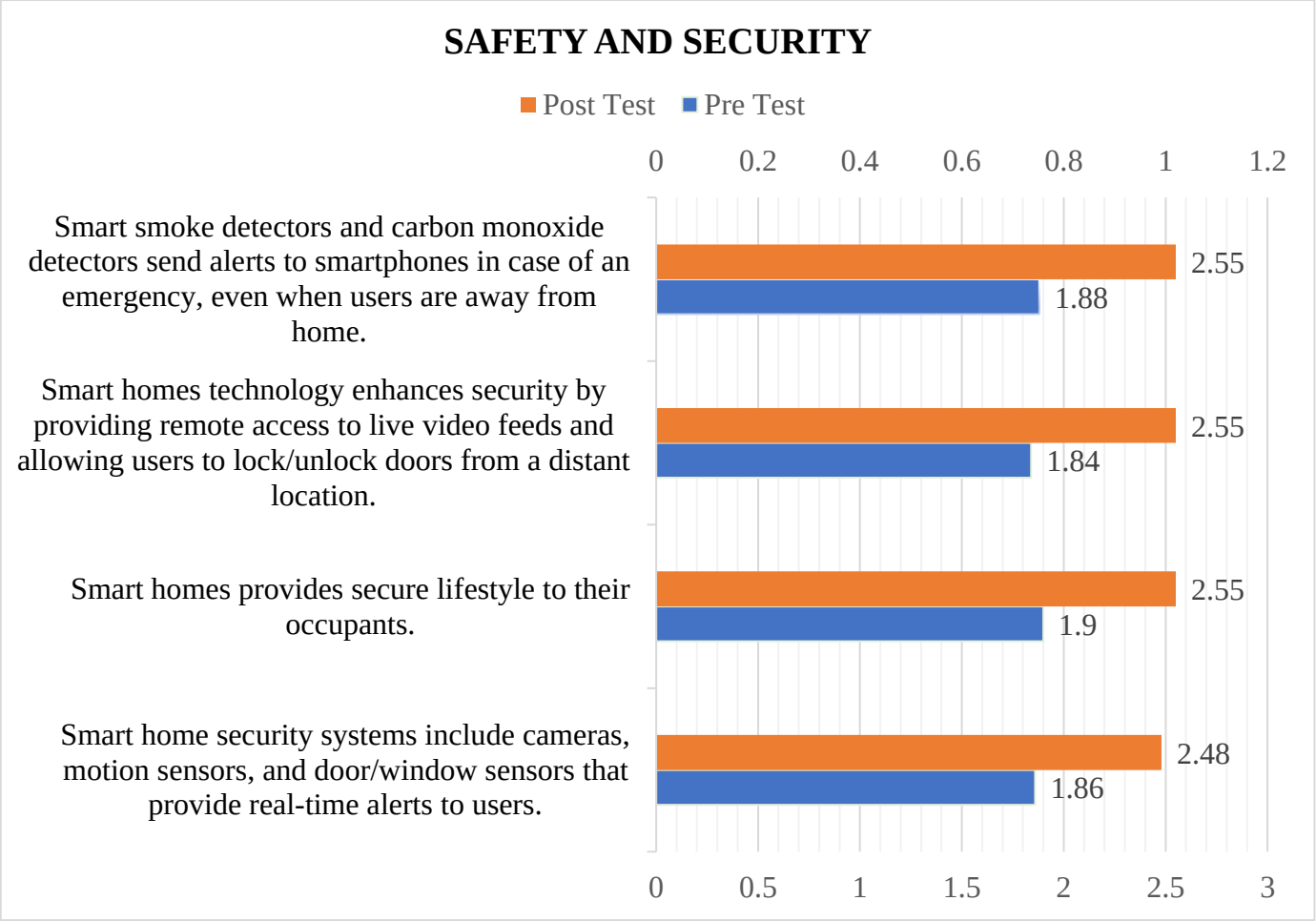


Figure 11 : Weighted Mean Scores of Pre- and Post-Test Knowledge Scale on "Smart Home Technology, Safety and Security " Among Working Women Before and After the Circulation of the Audio-Visual Aid

Table 14: Frequency and percentage distribution of respondents according to the Efficacy of Audio-Visual aid developed on Smart Homes Technology among working women regarding Smart Appliances in Pre Test and Post Test.

Sr. No.	Statements regarding Smart Appliances	Pre Test (n=150)						Weighted mean Score	Post Test (n=150)						Weighted mean Score
		Agree		Undecided		Disagree			Agree		Undecided		Disagree		
		f	%	*f*	%	*f*	%		*f*	%	*f*	%	*f*	%	
1.	Household appliances such as refrigerators, ovens, washing machines, toasters and coffee machines now come with internet connectivity for remote management.	47	31.34	33	22	70	46.66	1.84	98	65.33	35	23.33	17	11.34	2.54
2.	Smart appliances, such as refrigerators and washing machines, provides notifications about maintenance.	40	26.66	44	29.34	66	44	1.82	98	65.34	39	26	13	8.66	2.56
3.	Smart appliances, such as refrigerators and washing machines, provides notifications about energy usage.	45	30	29	19.34	29	50.66	1.79	96	64	40	26.66	14	9.34	2.54
							Total	**5.45**						**Total**	**7.64**

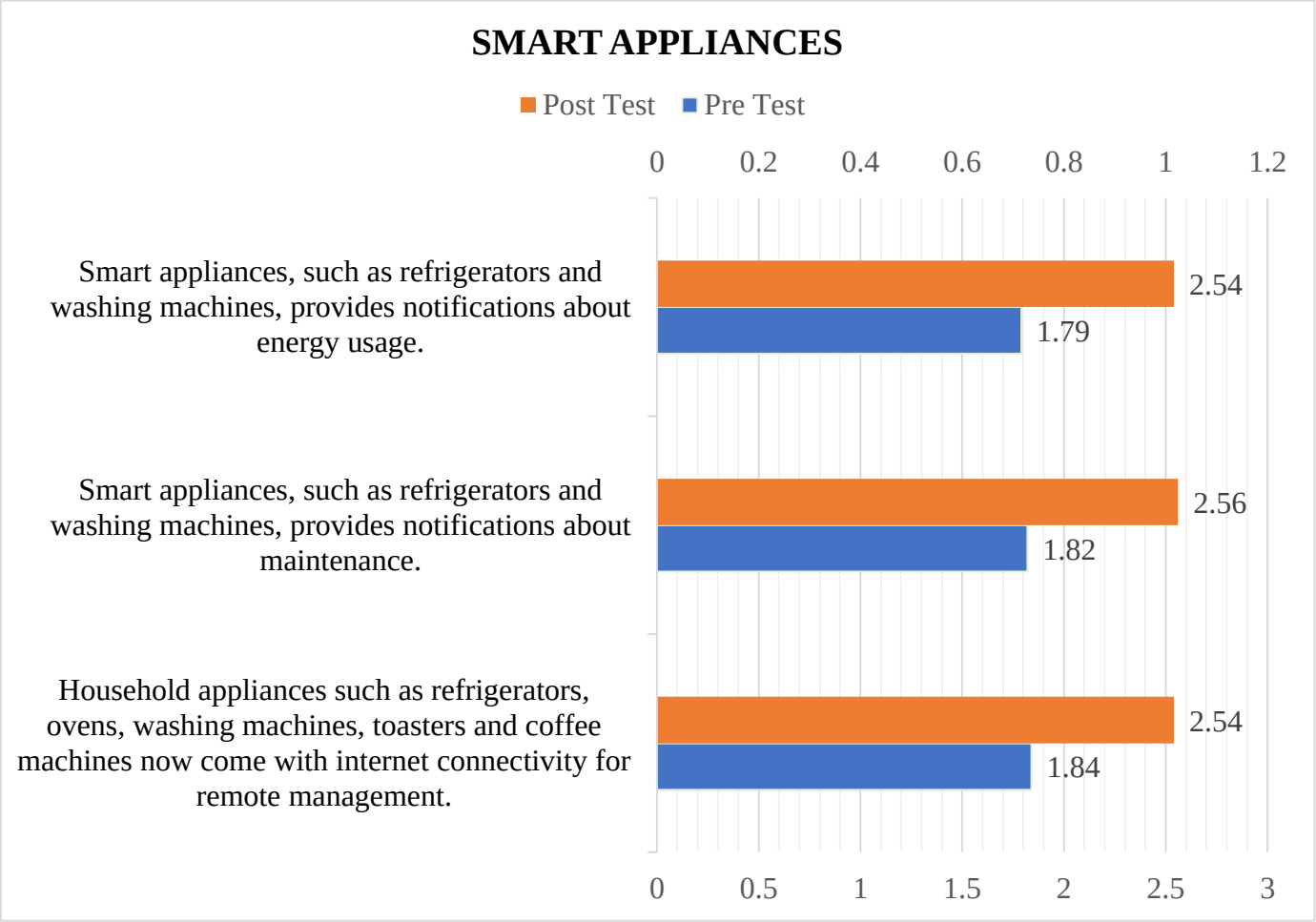


Figure 12: Weighted Mean Scores of Pre- and Post-Test Knowledge Scale on "Smart Home Technology, Smart Appliances " Among Working Women Before and After the Circulation of the Audio-Visual Aid

Table 15: Frequency and percentage distribution of respondents according to the Efficacy of Audio-Visual aid developed on Smart Homes Technology among working women regarding Smart Lighting and Climate Control in Pre Test and Post Test.

Sr. No.	Statements regarding Smart lighting and climate control	Pre Test (n=150)						Weighted mean Score	Post Test (n=150)						Weighted mean Score
		Agree		Undecided		Disagree			Agree		Undecided		Disagree		
		f	%	*f*	%	*f*	%		*f*	%	*f*	%	*f*	%	
1.	Smart thermostats is controlled remotely via smartphone apps, allowing users to adjust the temperature from anywhere.	40	26.66	33	22	77	51.34	1.75	101	67.34	30	20	19	12.66	2.54
2.	Smart lighting systems can be programmed to turn on and off automatically based on occupancy and time of day.	47	31.34	37	24.66	66	44	1.87	94	62.66	35	23.34	21	14	2.48
3.	Smart lighting systems adjusts colour temperature and brightness based on natural light levels and user preferences, enhancing the ambiance.	55	36.66	24	16	71	47.34	1.89	105	70	30	20	15	10	2.60
							Total	**5.51**						**Total**	**7.72**

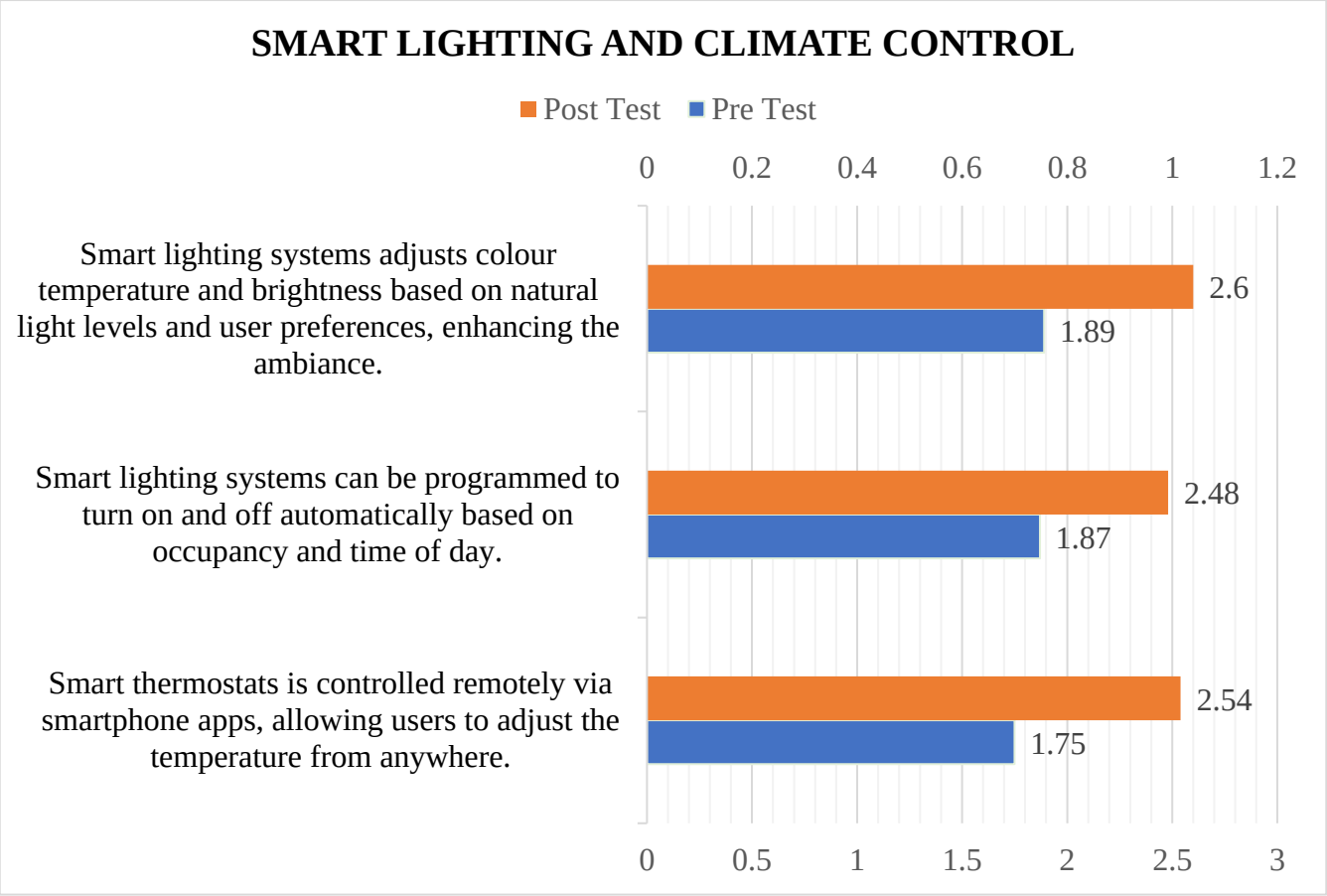


Figure 13: Weighted Mean Scores of Pre- and Post-Test Knowledge Scale on "Smart Home Technology, Smart Lighting and Climate Control" Among Working Women Before and After the Circulation of the Audio-Visual Aid

Table 16: Frequency and percentage distribution of respondents according to the Efficacy of Audio-Visual aid developed on Smart Homes Technology among working women regarding Energy Efficiency and Sustainability in Pre Test and Post Test.

Sr. No.	Statements regarding Energy Efficiency and Sustainability	Pre Test (n=150)						Weighted mean Score	Post Test (n=150)						Weighted mean Score
		Agree		Undecided		Disagree			Agree		Undecided		Disagree		
		f	%	*f*	%	*f*	%		*f*	%	*f*	%	*f*	%	
1.	Smart appliances aim to reduce energy waste.	43	28.66	38	25.34	69	46	1.82	98	65.34	32	21.33	20	13.33	2.52
2.	Smart appliances aim to improve the usability of energy for users.	44	29.34	33	22	73	48.66	1.80	102	68	31	20.66	17	11.34	2.56
3.	Smart home energy monitoring tools track electricity consumption.	47	31.34	33	22	70	46.66	1.84	103	68.66	29	12	18	13.34	2.56
4.	Smart home energy monitoring tools can help identify ways to reduce	51	34	26	17.34	73	48.66	1.85	103	68.66	36	24	11	7.34	2.61

	energy use and save money.														
5.	Smart home technologies, like solar panels and battery storage systems, generates and store renewable energy, potentially lowering utility bills.	43	28.66	38	25.34	69	46	1.82	105	70	26	17.34	19	12.66	2.57
6.	Smart irrigation systems can adjust watering schedules based on weather forecasts and soil moisture levels to conserve water.	50	33.34	30	20	70	46.66	1.86	96	64	37	24.66	17	11.34	2.52
							Total	**10.99**						**Total**	**15.34**

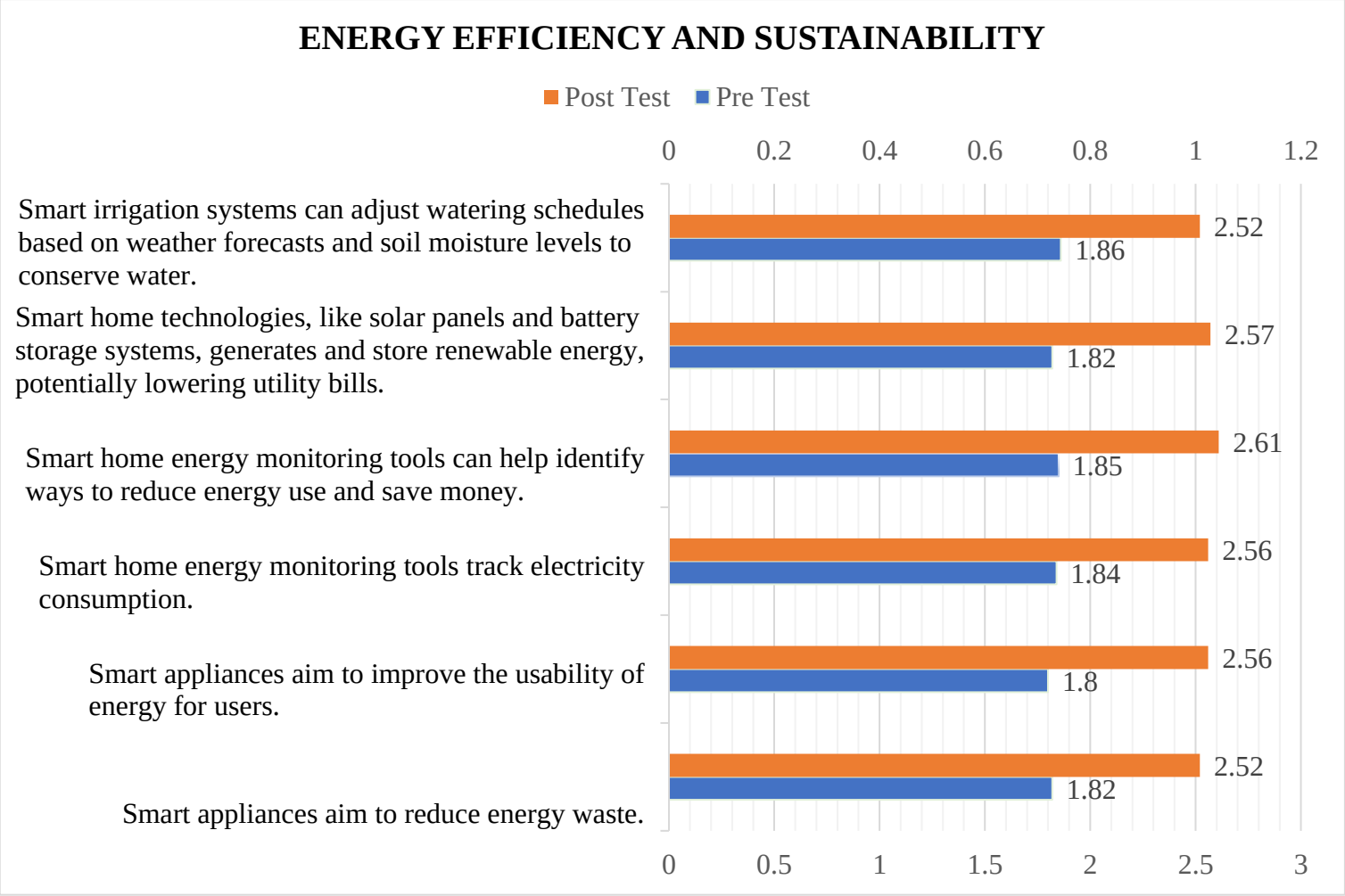


Figure 14: Weighted Mean Scores of Pre- and Post-Test Knowledge Scale on "Smart Home Technology, Energy Efficiency and Sustainability " Among Working Women Before and After the Circulation of the Audio-Visual Aid

4.3.3 Extent of knowledge regarding Smart Homes Technology after the circulation of Audio-Visual aid (Post-test phase)

A. Comfort and lifestyle

1. The data (Table 8 & Figure 6) indicated that 72 per cent of the respondents agreed that, Smart homes provides comfortable lifestyle to their occupants, while 9.34 per cent respondents were undecided and 18.66 per cent of the respondents were disagree.
2. The data (Table 8 & Figure 6) indicated that 66.66 per cent of the respondents agreed that, Smart homes offers a better quality of life by introducing automated assistive services, while 17.34 per cent respondents were undecided and 16 per cent of the respondents were disagree.
3. The data (Table 8 & Figure 6) indicated that 66 per cent of the respondents agreed that, Smart homes provides fully controlled lifestyle to their occupants. while 20.66 per cent respondents were undecided and 13.34 per cent of the respondents were disagree.
4. The data (Table 8 & Figure 6) indicated that 66.66 per cent of the respondents agreed that, Smart homes offers a better quality of life by introducing automated appliance control. while 20.67 per cent respondents were undecided and 12.67 per cent of the respondents were disagree.

B. Automation and control

1. The data (Table 9 & Figure 7) indicated that 64.6 per cent of the respondents agreed that, Smart home technologies allow automation routines, such as turning off all lights and locking doors when the user leaves the house while 26 per cent respondents were undecided and 9.34 per cent of the respondents were disagree.
2. The data (Table 9 & Figure 7) indicated that 68 per cent of the respondents agreed that, Smart home devices learn user preferences over time, optimizing settings for comfort and convenience automatically. while 23.34 per cent respondents were undecided and 8.66 per cent of the respondents were disagree.
3. The data (Table 9 & Figure 7) indicated that 68.66 per cent of the respondents agreed that, A user can control home appliances and devices remotely, which enables him/her to execute tasks before arriving home. while 21.34 per cent respondents were undecided and 10 per cent of the respondents were disagree.

4. The data (Table 9 & Figure 7) indicated that 68.66 per cent of the respondents agreed that, Smart home devices are controlled remotely via smartphone applications. while 19.34 per cent respondents were undecided and 12 per cent of the respondents were disagree.

C. Accessibility and Assistive Technology

1. The data (Table 10 & Figure 8) indicated that 68.66 per cent of the respondents agreed that, Smart home technology improves accessibility by allowing users with disabilities to control home device through voice commands or mobile apps. while 21.34 per cent respondents were undecided and 10 per cent of the respondents were disagree.
2. The data (Table 10 & Figure 8) indicated that 63.34 per cent of the respondents agreed that Voice assistants like Amazon Alexa and Google Assistant can be integrated into smart home systems to control devices using voice commands. while 18.66 per cent respondents were undecided and 18 per cent of the respondents were disagree.

D. Internet and Connectivity

1. The data (Table 11 & Figure 9) indicated that 72 per cent of the respondents agreed that, All smart home devices require a constant internet connection to function properly while 13.34 per cent respondents were undecided and 14.66 per cent of the respondents were disagree.
2. The data (Table 11 & Figure 9) indicated that 66.66 per cent of the respondents agreed that, Smart home systems are set up to control multiple devices from a single platform, providing a unified user experience. While 20.67 per cent respondents were undecided and 12.67 per cent of the respondents were disagree.
3. The data (Table 11 & Figure 9) indicated that 65.33 per cent of the respondents agreed that Once smart devices are connected, they often share data among themselves so that they work together. while 23.34 per cent respondents were undecided and 11.33 per cent of the respondents were disagree.

E. Smart Homes components and technology

1. The data (Table 12 & Figure 10) indicated that 64.66 per cent of the respondents agreed that, Smart home is residence equipped with technologies that include

sensors. while 22 per cent respondents were undecided and 13.34 per cent of the respondents were disagree.

2. The data (Table 12 & Figure 10) indicated that 67.34 per cent of the respondents agreed that Smart home is residence equipped with technologies that include wired and wireless networks. while 18.66 per cent respondents were undecided and 14 per cent of the respondents were disagree.
3. The data (Table 12 & Figure 10) indicated that 66 per cent of the respondents agreed that Smart home is a residence equipped with technologies that include actuators and intelligent systems. while 21.34 per cent respondents were undecided and 12.66 per cent of the respondents were disagree.
4. The data (Table 12 & Figure 10) indicated that 68 per cent of the respondents agreed that Artificial intelligence technology is also used in smart home appliances. while 20.66 per cent respondents were undecided and 11.34 per cent of the respondents were disagree.

F. Safety and Security

1. The data (Table 13 & Figure 11) indicated that 62.66 per cent of the respondents agreed that, Smart home security systems include cameras, motion sensors, and door/window sensors that provide real-time alerts to users. while 23.34 per cent respondents were undecided and 14 per cent of the respondents were disagree.
2. The data (Table 13 & Figure 11) indicated that 68 per cent of the respondents agreed that Smart homes provides secure lifestyle to their occupants. While 19.34 per cent respondents were undecided and 12.66 per cent of the respondents were disagree.
3. The data (Table 13 & Figure 11) indicated that 65.34 per cent of the respondents agreed that Smart home technologies enhances security by providing remote access to live video feeds and allowing users to lock/unlock doors from a distant location. while 24.66 per cent respondents were undecided and 10 per cent of the respondents were disagree.
5. The data (Table 13 & Figure 11) indicated that 68.66 per cent of the respondents agreed that Smart smoke detectors and carbon monoxide detectors send alerts to smartphones in case of an emergency, even when users are away from home. While 18 per cent respondents were undecided and 13.33 per cent of the respondents were disagree.

G. Smart Appliances

1. The data (Table 14 & Figure 12) indicated that slightly more than one fourth 65.33 per cent of the respondents agreed that Smart appliances, such as refrigerators and washing machines, provides notifications about maintenance. while 23.33 per cent respondents were undecided and 11.34 per cent of the respondents were disagree.
2. The data (Table 14 & Figure 12) indicated that 65.34 per cent of the respondents agreed that Smart appliances, such as refrigerators and washing machines, provides notifications about energy usage. While 26 per cent respondents were undecided and 8.66 per cent of the respondents were disagree.
3. The data (Table 14 & Figure 12) indicated that 64 per cent of the respondents agreed that Smart lighting systems can be programmed to turn on and off automatically based on occupancy and time of day. while 26.66 per cent respondents were undecided and 9.34 per cent of the respondents were disagree.

H. Smart Lighting and climate control

1. The data (Table 15 & Figure 13) indicated that 67.34 per cent of the respondents agreed that, Smart thermostats is controlled remotely via smartphone apps, allowing users to adjust the temperature from anywhere. While 20 per cent respondents were undecided and 12.66 per cent of the respondents were disagree.
2. The data (Table 15 & Figure 13) indicated that 62.66 per cent of the respondents agreed that Smart lighting systems can be programmed to turn on and off automatically based on occupancy and time of day. while 23.34 per cent respondents were undecided and 41 per cent of the respondents were disagree.
3. The data (Table 15 & Figure 13) indicated that 70 per cent of the respondents agreed that Smart lighting systems adjusts colour temperature and brightness based on natural light levels and user preferences, enhancing the ambiance. While 20 per cent respondents were undecided and 10 per cent of the respondents were disagree.

I. Energy efficiency and Sustainability

1. The data (Table 16 & Figure 14) indicated that 65.34 per cent of the respondents agreed that Smart appliances aim to reduce energy waste. while 21.33 per cent respondents were undecided and 13.33 per cent of the respondents were disagree.
2. The data (Table 16 & Figure 14) indicated that 68 per cent of the respondents agreed that Smart appliances aim to improve the usability of energy for users.

While 20.66 per cent respondents were undecided and 11.34 per cent of the respondents were disagree.

3. The data (Table 16 & Figure 14) indicated that 68.66 per cent of the respondents agreed that Smart home energy monitoring tools track electricity consumption. while 12 per cent respondents were undecided and 13.34 per cent of the respondents were disagree.
4. The data (Table 16 & Figure 14) indicated that 68.66 per cent of the respondents agreed that Smart home energy monitoring tools can help identify ways to reduce energy use and save money. While 24 per cent respondents were undecided and 7.34 per cent of the respondents were disagree.
5. The data (Table 16 & Figure 14) indicated that 70 per cent of the respondents agreed that Smart home technologies, like solar panels and battery storage systems, generates and store renewable energy, potentially lowering utility bills. while 17.34 per cent respondents were undecided and 12.66 per cent of the respondents were disagree.
6. The data (Table 16 & Figure 14) indicated that 64 per cent of the respondents agreed that Smart irrigation systems can adjust watering schedules based on weather forecasts and soil moisture levels to conserve water. while 24.66 per cent respondents were undecided and 11.34 per cent of the respondents were disagree.

4.3.4 Overall Extent of Knowledge of the respondents regarding Smart Homes Technology:

A scrutiny was made to find the overall Extent of knowledge of the respondents regarding Smart Homes Technology. The scores for each item in the scale were summated and possible range of minimum and maximum scores were divided into three equal categories. Minimum score was 33 and maximum score was 99. High score reflected high overall Extent of knowledge of the respondents regarding Smart Homes Technology.

From (Table 16 and Figure 15) it is observed that 36.67 per cent of the respondents had knowledge at high extent of knowledge before circulation of Audio-Visual aid whereas score was increased by 19.33 per cent of the respondents had knowledge at the moderate extent before the circulation of Audio-Visual aid and 26 per cent of the same were after the Audio-Visual aid. Followed by 44 per cent of the respondents were aware at low

extent of knowledge before the circulation of Audio-Visual aid whereas 44 per cent of the respondents had low extent of knowledge after the Audio-Visual aid.

Table 17: Overall Extent of knowledge of the respondents regarding Smart Homes Technology

Sr. No.	Overall Extent of knowledge of the respondents regarding Smart Homes Technology	Range of Scores	*f*	%
	Pre-Test			
1.	High Extent of Knowledge	78-99	55	36.67
2.	Moderate Extent of Knowledge	55-77	29	19.33
3.	Low extent of Knowledge	33-54	66	44
	Post-Test			
1.	High Extent of Knowledge	78-99	103	68.67
2.	Moderate Extent of Knowledge	55-77	39	26
3.	Low extent of Knowledge	33-54	8	5.33

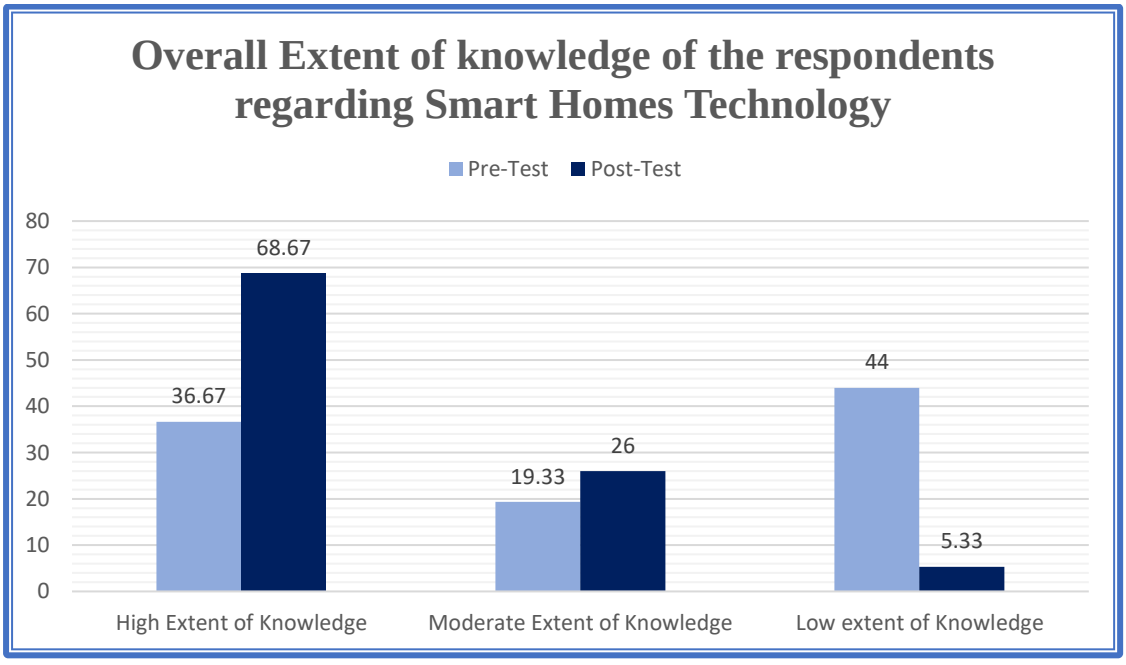


Figure 15: Percentage distribution of respondents according to their Efficacy of developed Audio-Visual aid on Smart home technology

Section 4

4.4 Testing of Hypothesis

Based on the objectives of the study a hypothesis was formulated. For the present investigation, as per the nature of the variables, t-test were computed. For the purpose of statistical analysis, null forms of the hypothesis were formulated. The results are discussed as under.

H_{01}: Their exists a difference in the extent of knowledge regarding smart homes technology among working women before and after circulation of Audio - Visual aid.

Table 18: t-test showing difference in the extent of knowledge regarding smart homes technology among working women before and after circulation of Audio-Visual aid.

Sr. No.	Variables	Mean score	t-value	df	Level of significance
1.	Pre Test	61.226	7.748	149	0.05
2.	Post Test	84.046			

The computation of t-value showed significant difference in the extent of knowledge regarding smart homes technology among working women before and after circulation of Audio-Visual aid. Hence, the null hypothesis was rejected (Table 18). Therefore, it was concluded that the extent of knowledge of the respondents' differed before and after the after circulation of Audio-Visual aid and it was found to be high after the implementation of the circulation of Audio-Visual aid.

Conclusion

In order to achieve objective of the study, the data of the respondents were collected regarding personal information and family information. It was observed that majority of the respondents belonged to the age group of 32-38 years and 33.31 was the mean of Age of the respondents. 44.66 per cent of the respondents were living in Ahmedabad. 45.33 per cent of the respondents were Graduate. The majority of the respondents were working in Private Sector with 64.67 per cent. 50.66 per cent of the respondents had Monthly Income of ₹10,000 – ₹30,000 rupees with the mean of 39285 and Standard Deviation of 36558.41. The majority Marital Status were Married which were 74 per cent. The Type of Family the respondents had were Nuclear with 66 per cent. Total number of family members were 4-7 with 60 per cent. Number of earning members in the family are 1-3 with 92.66 percent. The majority Type of House were apartment with36 per cent. The list of Smart Homes Appliances/ Devices at home were 4-7 with 55.33 per cent and the majority of the respondents owned Google Assistant with 46.67 per cent.

Before and after the training program regarding Smart Homes Technology of the respondents Extent of Knowledge was analyzed. It was found that 7.63 per cent of the respondents had knowledge regarding Comfort and Lifestyle of Smart Homes Technology where 10.09 per cent of the respondents got awareness after the Audio-Visual aid was presented. 7.38 per cent of the respondents had knowledge regarding Automation and Control of Smart Homes Technology where 10.28 per cent of the respondents got awareness after the Audio-Visual aid was presented. 3.74 per cent of the respondents had knowledge regarding Accessibility and Assistive of Smart Homes Technology where 5.03 per cent of the respondents got awareness after the Audio-Visual aid was presented. 5.52 per cent of the respondents had knowledge regarding Internet and connectivity of Smart Homes Technology where 7.56 per cent of the respondents got awareness after the Audio-Visual aid was presented. 6.91 per cent of the respondents had knowledge regarding Smart Homes Components and Technologies of Smart Homes Technology where 10.13 per cent of the respondents got awareness after the Audio-Visual aid was presented. 7.48 per cent of the respondents had knowledge regarding Safety and Security of Smart Homes Technology where 10.13 per cent of the respondents got awareness after the Audio-Visual aid was presented. 5.45 per cent of the respondents had knowledge regarding Smart Appliances of Smart Homes

Technology where 7.64 per cent of the respondents got awareness after the Audio-Visual aid was presented. 5.51 per cent of the respondents had knowledge regarding Smart Lighting and Climate Control of Smart Homes Technology where 7.72 per cent of the respondents got awareness after the Audio-Visual aid was presented. 10.99 per cent of the respondents had knowledge regarding Energy efficiency and sustainability of Smart Homes Technology where 15.34 per cent of the respondents got awareness after the Audio-Visual aid was presented. A significant relationship was found between the Extent of Knowledge regarding Smart Homes Technologies. An Audio-Visual aid developed on Smart Homes Technology has marked a positive difference in existing knowledge of the respondents regarding Smart Homes Technology.

SUMMARY, CONCLUSION AND RECOMMENDATION

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATION

Smart home technology is revolutionizing the way people interact with their living spaces, making homes more convenient, energy-efficient, and secure. This innovation is driven by the Internet of Things (IoT), which enables various household devices to communicate with each other and be controlled remotely through smartphones, tablets, or voice assistants. From automated lighting and climate control to smart security systems and kitchen appliances, smart home technology is rapidly integrating into modern lifestyles, offering significant benefits while also presenting certain challenges. One of the primary advantages of smart home technology is convenience. With the ability to control home functions remotely, users can adjust lighting, temperature, and even appliances with a simple voice command or through mobile apps. Smart home assistants like Amazon Alexa, Google Assistant, and Apple's Siri allow users to set schedules, get reminders, and automate multiple tasks at once. Additionally, smart thermostats like Nest and Ecobee learn user preferences and adjust heating and cooling accordingly, reducing unnecessary energy consumption. Similarly, smart lighting systems automatically turn off when rooms are unoccupied or adjust brightness based on natural light, minimizing electricity bills and contributing to environmental sustainability. Smart security cameras, motion sensors, and doorbell cameras provide real-time monitoring and alerts, enhancing safety and giving homeowners peace of mind, especially when away.

For working professionals, especially women balancing multiple responsibilities, smart home technology offers greater control and flexibility in managing household tasks. Automated kitchen appliances, like programmable coffee makers and ovens, simplify meal preparation, while robotic vacuum cleaners ensure homes remain clean with minimal effort. However, despite its advantages, smart home technology faces challenges, particularly concerning cybersecurity and data privacy. As these devices are connected to the internet, they are vulnerable to hacking and unauthorized access. Users must ensure strong passwords, regular software updates, and secure networks to mitigate risks. Another challenge is device compatibility, as not all smart devices integrate seamlessly with each other, making it difficult for users to create a fully interconnected system. Looking ahead, advancements in artificial intelligence (AI) and

machine learning will further enhance smart home technology, making homes even more intuitive, adaptive, and energy-efficient. As innovations continue, smart homes will become more personalized, sustainable, and responsive to user needs, ultimately shaping the future of modern living.

Research on smart home technology has been conducted globally, highlighting its impact on convenience, security, energy efficiency, and quality of life. Studies outside India have primarily focused on technological advancements, automation, and artificial intelligence integration. Researchers in the United States and Europe have explored how smart home ecosystems optimize energy consumption, enhance security through AI-driven surveillance, and assist aging populations with independent living. Studies have also examined the cybersecurity risks associated with interconnected devices and proposed solutions to strengthen data privacy and security. Additionally, research has analysed consumer behaviour and adoption patterns, revealing that factors like affordability, ease of use, and perceived benefits influence smart home adoption rates worldwide.

In India, research has emphasized the practical applications of smart home technology in urban and semi-urban settings. Studies have explored the role of IoT in home automation, energy-efficient systems, and security solutions tailored to Indian households. Some research has focused on the accessibility and affordability of smart home devices, considering the socio-economic diversity of Indian consumers. Additionally, studies have examined how smart home automation impacts working professionals, particularly women, by reducing household burdens and enhancing time management. While India's smart home market is growing, research also highlights challenges such as data security, compatibility issues, and the digital divide in rural areas. Overall, both global and Indian studies underscore the potential of smart home technology to improve daily life, while also acknowledging the need for advancements in security, affordability, and user-friendliness to drive widespread adoption.

Statement of the problem

The aim of the present research was to develop an Audio- Visual aid on Smart Homes Technology among working women.

Objectives

1. To study knowledge regarding Smart Homes Technology among working women.
2. To develop an Audio-Visual aid on Smart Homes Technology.
3. To assess the Efficacy of developed Audio-Visual aid on Smart Homes Technology among working women through comparative analysis.

Hypothesis

1. There exists a difference in the extent of knowledge regarding smart homes technology among working women before and after circulation of Audio-Visual aid.

Delimitation of the study

1. The study will be limited to working women of 24-45 years of age group.

Methodology

The research design for the present study was descriptive in nature. The samples of the study were Working women living in Vadodara, Ahmedabad and Surat city of Gujarat state. The consent was taken from the respondents who agreed to participate in the study. Purposive snowball technique was utilized for the data collection on 150 respondents. The data collection tool for the present study was questionnaire to find out extent of knowledge of the respondents regarding Smart Homes Technology before and after Audio- visual aid. Besides of background information, questionnaire consists two more major sections on the Knowledge scale for "Smart homes Technology" (will be administrated before circulation of Audio-Visual aid) and Knowledge scale for "Smart homes Technology" (will be administrated before circulation of Audio-Visual aid). This section 2 and 3 comprised of 33 statements each related to Extent of knowledge regarding Smart Homes Technology. It had 3 continuum for the responses "Agree", "Undecided", "Disagree" which were scored 3, 2 and 1 respectively. High scores reflected high extent of knowledge regarding smart homes technology among working women. For the validity of the content given to the experts from department of Family and Community Resource Management, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda, Vadodara. The corrections were done by the researcher as per recommendation and suggestions of experts in the field. The procedure of analysis of the data comprised of categorization, coding, tabulation and statistical analysis. The survey was implemented by the researcher from 24th October

to 13th November 2024 in English language for a better understanding of the respondents.

Audio-Visual aid on Smart Homes Technology

An Audio Visual aid on smart homes technology was developed in English language, covering various areas including Comfort and Lifestyle, Automation and Control, Accessibility and Assistive Technology, Internet and connectivity, Smart Home Components and technologies, Safety and Security, Smart Appliances, Smart lighting and climate control, Energy Efficiency and Sustainability. It was implemented into three stages.

Pre- testing Phase: a questionnaire for knowledge regarding smart homes technology before circulation of Audio-Visual aid was distributed to the respondents. After that the Audio-visual aid was shown containing the various aspects of Smart Homes Technology namely Comfort and Lifestyle, Automation and Control, Accessibility and Assistive Technology, Internet and connectivity, Smart Home Components and technologies, Safety and Security, Smart Appliances, Smart lighting and climate control, Energy Efficiency and Sustainability . The content was reviewed and translated in English for the presentation. Content validity was confirmed with five judges related to the field of Family and Community Resource Management. The researcher prepared an Audio-Visual in the regional language of English to enhance comprehension and stimulate interest among the respondents. The researcher collected knowledge about Smart Homes Technology through a questionnaire, and obtained consent from respondents before the intervention phase.

Intervention Phase: During these phase, the researcher concentrated on imparting knowledge to the respondents about smart homes technology. Comfort and Lifestyle, Automation and Control, Accessibility and Assistive Technology, Internet and connectivity, Smart Home Components and technologies, Safety and Security, Smart Appliances, Smart lighting and climate control, Energy Efficiency and Sustainability were covered. Utilizing Audio- visual aid as a medium, the researcher effectively conveyed these concepts, translating complex ideas into easily understandable content for the respondents. This visual aid not only facilitated comprehension but also sparked interest among the respondents, enhancing their engagement with the material.

Post-testing Phase: After the circulation of Audio-Visual aid, in order to achieve one of the objectives aimed to assess the knowledge of the respondents regarding Smart homes technology, the questionnaire was distributed comprising of questions on assessing the knowledge of respondents regarding Smart Homes Technology after the documentary. The data collected in pre-testing phase helped in understanding the impact of the Intervention program. The same set of questionnaire was distributed to assess the Extent of Knowledge of the respondents regarding Smart homes technology after the Audio- Visual aid was shown. Furthermore, it provided valuable insights into the gained an understanding of the knowledge by the respondents regarding Smart Homes Technology.

Major Findings

The major findings of the study are described here.

Section 1: Demographic Information: This section deals with the personal information and family information reported as per below.

- **Personal Information:** The age of the respondents ranged between 24 to 45 years, with a mean age of 33.31 years and a standard deviation of 6.18. The majority (47.34 per cent) of the respondents were in the 32 to 38 years age group. In terms of place of residence, most respondents (44.66 per cent) were living in Ahmedabad city. Regarding educational qualifications, the highest percentage (52 per cent) were postgraduates. In terms of occupation, the majority (64.67 per cent) were working in the private sector. The data on monthly income revealed that the highest percentage (50.66 per cent) of respondents had a monthly income ranging between ₹10,000 to ₹30,000. The mean monthly income was ₹39,258.38 with a standard deviation of ₹36,558.41.
- **Family Information:** The majority of respondents (74%) were married, while a smaller proportion were single, separated, or divorced. Most participants (66%) lived in nuclear families, and 60% had 4 to 7 family members. In terms of earning members in the household, 92.66% of the respondents had 1 to 3 earning members, indicating financial stability. Regarding housing type, the highest proportion (36%) lived in apartments, followed by duplexes, tenements, and bungalows. These findings suggest that most working women in the study belonged to nuclear families, had multiple earning members, and resided in

modern urban housing.The majority of respondents (55.33%) had 4 to 7 smart home devices or appliances in their homes. Regarding smart home assistants, 46.67% of respondents used Google Assistant.

Section 2: Development of Audio-Visual aid (documentary)

The study focused on developing an informative and engaging audio-visual aid on smart home technology tailored for working women. The goal was to highlight how smart home devices can streamline daily tasks, enhance security, and improve energy efficiency. To simplify the creation process, the AI-powered software Invidio was used, allowing for efficient video production with minimal manual effort. The software assisted in generating voiceovers, animations, and seamless video editing, while AI-driven scripting ensured a natural and clear narration. Pre-designed templates helped in assembling visuals quickly, and automated subtitles made the content more accessible. This approach resulted in a well-structured, visually appealing, and easy-to-understand video that effectively conveyed smart home concepts to the target audience.

Section 3: Efficacy of Audio-Visual aid developed on smart homes technology among working women

The extent of knowledge of the respondents before and after the circulation of Audio-Visual aid was observed that 36.67 per cent of the respondents had knowledge at high extent of knowledge before circulation of Audio-Visual aid whereas score was increased by 19.33 per cent of the respondents had knowledge at the moderate extent before the circulation of Audio-Visual aid and 26 per cent of the same were after the Audio-Visual aid. Followed by 44 per cent of the respondents were aware at low extent of knowledge before the circulation of Audio-Visual aid whereas 44 per cent of the respondents had low extent of knowledge after the Audio-Visual aid.

Section 4: Testing of Hypothesis

The computation of t-value depicted that there is 0.05 significant difference in the extent of knowledge regarding smart homes technology among working women before and after circulation of Audio - Visual aid. Hence, the null hypothesis was rejected. Therefore, it was concluded that the extent of knowledge of the respondents' differed before and after the after circulation of Audio-Visual aid and it was found to be high after the implementation of the circulation of Audio-Visual aid.

Conclusion

In order to achieve objective of the study, the data of the respondents were collected regarding personal information and family information. It was observed that majority of the respondents belonged to the age group of 32-38 years and 33.31 was the mean of Age of the respondents. 44.66 per cent of the respondents were living in Ahmedabad. 45.33 per cent of the respondents were Graduate. The majority of the respondents were working in Private Sector with 64.67 per cent. 50.66 per cent of the respondents had Monthly Income of ₹10,000 – ₹30,000 rupees with the mean of 39285 and Standard Deviation of 36558.41. The majority Marital Status were Married which were 74 per cent. The Type of Family the respondents had were Nuclear with 66 per cent. Total number of family members were 4-7 with 60 per cent. Number of earning members in the family are 1-3 with 92.66 percent. The majority Type of House were apartment with36 per cent. The list of Smart Homes Appliances/ Devices at home were 4-7 with 55.33 per cent and the majority of the respondents owned Google Assistant with 46.67 per cent.

Before and after the training program regarding Smart Homes Technology of the respondents Extent of Knowledge was analyzed. It was found that 7.63 per cent of the respondents had knowledge regarding Comfort and Lifestyle of Smart Homes Technology where 10.09 per cent of the respondents got awareness after the Audio-Visual aid was presented. 7.38 per cent of the respondents had knowledge regarding Automation and Control of Smart Homes Technology where 10.28 per cent of the respondents got awareness after the Audio-Visual aid was presented. 3.74 per cent of the respondents had knowledge regarding Accessibility and Assistive of Smart Homes Technology where 5.03 per cent of the respondents got awareness after the Audio-Visual aid was presented. 5.52 per cent of the respondents had knowledge regarding Internet and connectivity of Smart Homes Technology where 7.56 per cent of the respondents got awareness after the Audio-Visual aid was presented. 6.91 per cent of the respondents had knowledge regarding Smart Homes Components and Technologies of Smart Homes Technology where 10.13 per cent of the respondents got awareness after the Audio-Visual aid was presented. 7.48 per cent of the respondents had knowledge regarding Safety and Security of Smart Homes Technology where 10.13 per cent of the respondents got awareness after the Audio-Visual aid was presented. 5.45 per cent of the respondents had knowledge regarding Smart Appliances of Smart Homes

Technology where 7.64 per cent of the respondents got awareness after the Audio-Visual aid was presented. 5.51 per cent of the respondents had knowledge regarding Smart Lighting and Climate Control of Smart Homes Technology where 7.72 per cent of the respondents got awareness after the Audio-Visual aid was presented. 10.99 per cent of the respondents had knowledge regarding Energy efficiency and sustainability of Smart Homes Technology where 15.34 per cent of the respondents got awareness after the Audio-Visual aid was presented. A significant relationship was found between the Extent of Knowledge regarding Smart Homes Technologies. An Audio-Visual aid developed on Smart Homes Technology has marked a positive difference in existing knowledge of the respondents regarding Smart Homes Technology.

Implications of the study

The findings of this study had several implications for the field of family and community resource management, For the government, for non-government organization, for working women, For librarians and documentation Centers.

For the Field of Family and Community Resource Management

The curriculum of Family and Community Resource Management focuses on optimizing household and community resources, including financial planning, technology integration, and efficient home management. As smart home technology becomes increasingly relevant, this study will help educators update course content to include IoT-based home automation, centralized control systems, and digital resource management. Students can implement awareness programs and plan activities to enhance the adoption of smart home technologies among urban and rural working women, addressing their specific needs and challenges. Additionally, findings from this study will support students specializing in home automation and technology-driven household management in bridging gaps in existing research.

For the Government

The findings of this study will provide valuable insights for policymakers regarding the necessity of smart home technology awareness and education among working women. The government can use this research to develop initiatives aimed at promoting digital literacy, home automation adoption, and IoT-based resource optimization. The study will also assist in formulating policies that encourage financial incentives, subsidies, or

training programs for women to integrate smart home technologies into their daily lives, improving their work-life balance and household efficiency. Moreover, it can aid in the development of outreach programs to increase awareness about government schemes related to home automation, energy efficiency, and digital safety, particularly at the grassroots level.

For Non-Government Organizations

Due to the lack of awareness about smart home technologies among working women, NGOs can take the initiative to design effective programs that educate and empower them. These initiatives can focus on the benefits of home automation, IoT-based control systems, and energy-efficient appliances, particularly for women managing work and household responsibilities. NGOs can use the findings of this study to develop targeted awareness campaigns, workshops, and training sessions to enhance women's knowledge and adoption of smart home solutions.

Furthermore, the research findings can help NGOs plan and implement skill development programs that teach women how to use smart home devices for better time management, energy conservation, and security. Special attention can be given to rural and low-income working women, ensuring accessibility to affordable smart home solutions. NGOs can also collaborate with technology companies and financial institutions to provide support, such as subsidized devices, installment based purchasing options, or digital literacy programs.

For Working Women

The respondents for this study were working women, and the developed audio-visual aid was designed to enhance their understanding of smart home technology. By using this educational tool, women can gain insights into various home automation systems, their benefits, and how to integrate them into daily life. Learning about smart appliances, security systems, and energy management will help women optimize household tasks, save time, and reduce stress.

Working women will also be able to make informed decisions about selecting and investing in smart home devices that suit their needs. Increased awareness and adoption of these technologies can lead to greater efficiency, improved work-life balance, and enhanced security, ultimately contributing to their overall well-being.

For Librarians and Documentation Centre's

The results of this study will serve as a valuable resource for librarians and documentation centre's, providing easy access to information on smart home technology and its impact on working women. These institutions can store and disseminate research findings, training materials, and educational aids to support further studies and awareness initiatives.

Librarians can use this study to build digital and physical repositories focused on home automation, IoT, and technology-driven household management. Additionally, documentation centre's can integrate these findings into community resource programs, making smart home knowledge more accessible to working women who seek guidance on optimizing their homes through technology.

Recommendations for Further Studies

1. An investigation in other cities of Gujarat or different states in India can be conducted to assess the level of knowledge on smart home technology among working women through educational training programs.
2. Identify the factors and challenges faced by working women, especially in rural areas, in gaining knowledge and adopting smart home technology during skill development programs.
3. Exploring how IoT and smart homes are empowering women by offering more control over their home environment, time, and safety.
4. Cybersecurity Challenges in IoT-Enabled Homes for Exploring vulnerabilities and solutions in smart home security.
5. Ethical Concerns in Smart Home Surveillance in Investigating privacy implications of always-on smart devices.

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APPENDICES

Institutional Ethics
Committee for Human
Research
(IECHR)

FACULTY OF FAMILY AND COMMUNITY SCIENCES
THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA

Ethical Compliance Certificate 2024-2025

This is to certify Ms. Tasneem Kapasi study titled; "Efficacy of developed Audio-Visual aid on Smart Homes technology among Working Women." from Department of Family and Community Resource Management has been approved by the Institutional Ethics Committee for Human Research (IECHR), Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda. The study has been allotted the ethical approval number IECHR/FCSc/M.Sc./10/2024/27.

Komal

Prof. Komal Chauhan
Member Secretary
IECHR

Prof. Mini Sheth
Chairperson
IECHR

Chair Person
IECHR
Faculty of Family & Community Sciences
The Maharaja Sayajirao University of Baroda

Appendices-II

QUESTIONNAIRE

Section1- Background Information

I. Name : _____

II. Email Id : _____

III. Phone no : _____

IV. Age (in years) : _____

V. Place:

1) Vadodara
2) Ahmedabad
3) Surat

VI. Type of Occupation:

1) Service in Government Sector
2) Service in Private sector
3) Business

VII. Education

1) High School
2) Diploma
3) Graduate
4) Post Graduate
5) PhD

VIII. Monthly Income (in Rupees ₹) _____

IX. Marital status

1) Single
2) Married
3) Separated
4) Divorced

X. Type of family

1) Nuclear
2) Joint

XI. Number of Total Family Members _____

XII. Number of earning members in the Family _____

XIII. Type of House

1) Apartment
2) Duplex
3) Tenement
4) Bungalow

XIV. Total list of Smart Home devices / appliances at home _____

XV. Ownership of Smart Home voice assistance

1) Alexa
2) Google assistant
3) Apple assistant
4) Any other _____
5) None of the above

Section – II

Knowledge scale for "Smart homes Technology"

(will be administrated before circulation of Audio-Visual aid)

The response structure for the below statements will be Agree, Undecided and Disagree.

Sr. No.	Statements regarding Extent of knowledge regarding Smart Homes Technology among working women	Agree	Undecided	Disagree
A	**Comfort and Lifestyle**			
1.	Smart homes provides comfortable lifestyle to their occupants.			
2.	Smart homes offers a better quality of life by introducing automated assistive services.			
3.	Smart homes provides fully controlled lifestyle to their occupants.			
4.	Smart homes offers a better quality of life by introducing automated appliance control.			
B	**Automation and Control**			
1.	Smart home technologies allow automation routines, such as turning off all lights and locking doors when the user leaves the house.			
2.	Smart home devices learn user preferences over time, optimizing settings for comfort and convenience automatically.			
3.	A user can control home appliances and devices remotely, which enables him/her to execute tasks before arriving home.			
4.	Smart home devices are controlled remotely via smartphone applications.			
C	**Accessibility and Assistive Technology**			
1.	Smart home technology improves accessibility by allowing users with disabilities to control home device through voice commands or mobile apps.			

2.	Voice assistants like Amazon Alexa and Google Assistant can be integrated into smart home systems to control devices using voice commands.			
D	**Internet and connectivity**			
1.	All smart home devices require a constant internet connection to function properly.			
2.	Smart home systems are set up to control multiple devices from a single platform, providing a unified user experience.			
3.	Once smart devices are connected, they often share data among themselves so that they work together.			
E	**Smart Home Components and technologies**			
1.	Smart home is residence equipped with technologies that include sensors.			
2.	Smart home is residence equipped with technologies that include wired and wireless networks.			
3.	Smart home is a residence equipped with technologies that include actuators and intelligent systems.			
4.	Artificial Intelligence technology is also used in smart home appliances.			
F	**Safety and Security**			
1.	Smart home security systems include cameras, motion sensors, and door/window sensors that provide real-time alerts to users.			
2.	Smart homes provides secure lifestyle to their occupants.			
3.	Smart home technologies enhances security by providing remote access to live video feeds and allowing users to lock/unlock doors from a distant location.			
4.	Smart smoke detectors and carbon monoxide detectors send alerts to smartphones in case of an emergency, even when users are away from home.			

G.	**Smart Appliances**			
1.	Household appliances such as refrigerators, ovens, washing machines, toasters and coffee machines now come with internet connectivity for remote management.			
2.	Smart appliances, such as refrigerators and washing machines, provides notifications about maintenance.			
3.	Smart appliances, such as refrigerators and washing machines, provides notifications about energy usage.			
H	**Smart Lighting and Climate Control**			
1.	Smart thermostats is controlled remotely via smartphone apps, allowing users to adjust the temperature from anywhere.			
2.	Smart lighting systems can be programmed to turn on and off automatically based on occupancy and time of day.			
3.	Smart lighting systems adjusts colour temperature and brightness based on natural light levels and user preferences, enhancing the ambiance.			
I	**Energy Efficiency and Sustainability**			
1.	Smart appliances aim to reduce energy waste.			
2.	Smart appliances aim to improve the usability of energy for users.			
3.	Smart home energy monitoring tools track electricity consumption.			
4.	Smart home energy monitoring tools can help identify ways to reduce energy use and save money.			
5.	Smart home technologies, like solar panels and battery storage systems, generates and store renewable energy, potentially lowering utility bills.			
6.	Smart irrigation systems can adjust watering schedules based on weather forecasts and soil moisture levels to conserve water.			

Section – III

Knowledge scale for "Smart homes Technology"

(will be administrated after circulation of Audio-Visual aid)

The response structure for the below statements will be Agree, Undecided and Disagree.

Sr. No.	Statements regarding Extent of knowledge regarding Smart Homes Technology among working women	Agree	Undecided	Disagree
A	**Comfort and Lifestyle**			
1.	Smart homes provides comfortable lifestyle to their occupants.			
2.	Smart homes offers a better quality of life by introducing automated assistive services.			
3.	Smart homes provides fully controlled lifestyle to their occupants.			
4.	Smart homes offers a better quality of life by introducing automated appliance control.			
B	**Automation and Control**			
1.	Smart home technologies allow automation routines, such as turning off all lights and locking doors when the user leaves the house.			
2.	Smart home devices learn user preferences over time, optimizing settings for comfort and convenience automatically.			
3.	A user can control home appliances and devices remotely, which enables him/her to execute tasks before arriving home.			
4.	Smart home devices are controlled remotely via smartphone applications.			
C	**Accessibility and Assistive Technology**			
1.	Smart home technology improves accessibility by allowing users with disabilities to control home device through voice commands or mobile apps.			

2.	Voice assistants like Amazon Alexa and Google Assistant can be integrated into smart home systems to control devices using voice commands.			
D	**Internet and connectivity**			
1.	All smart home devices require a constant internet connection to function properly.			
2.	Smart home systems are set up to control multiple devices from a single platform, providing a unified user experience.			
3.	Once smart devices are connected, they often share data among themselves so that they work together.			
E	**Smart Home Components and technologies**			
1.	Smart home is residence equipped with technologies that include sensors.			
2.	Smart home is residence equipped with technologies that include wired and wireless networks.			
3.	Smart home is a residence equipped with technologies that include actuators and intelligent systems.			
4.	Artificial Intelligence technology is also used in smart home appliances.			
F	**Safety and Security**			
1.	Smart home security systems include cameras, motion sensors, and door/window sensors that provide real-time alerts to users.			
2.	Smart homes provides secure lifestyle to their occupants.			
3.	Smart home technologies enhances security by providing remote access to live video feeds and allowing users to lock/unlock doors from a distant location.			
4.	Smart smoke detectors and carbon monoxide detectors send alerts to smartphones in case of an emergency, even when users are away from home.			

G.	**Smart Appliances**			
1.	Household appliances such as refrigerators, ovens, washing machines, toasters and coffee machines now come with internet connectivity for remote management.			
2.	Smart appliances, such as refrigerators and washing machines, provides notifications about maintenance.			
3.	Smart appliances, such as refrigerators and washing machines, provides notifications about energy usage.			
H	**Smart Lighting and Climate Control**			
1.	Smart thermostats is controlled remotely via smartphone apps, allowing users to adjust the temperature from anywhere.			
2.	Smart lighting systems can be programmed to turn on and off automatically based on occupancy and time of day.			
3.	Smart lighting systems adjusts colour temperature and brightness based on natural light levels and user preferences, enhancing the ambiance.			
I	**Energy Efficiency and Sustainability**			
1.	Smart appliances aim to reduce energy waste.			
2.	Smart appliances aim to improve the usability of energy for users.			
3.	Smart home energy monitoring tools track electricity consumption.			
4.	Smart home energy monitoring tools can help identify ways to reduce energy use and save money.			
5.	Smart home technologies, like solar panels and battery storage systems, generates and store renewable energy, potentially lowering utility bills.			
6.	Smart irrigation systems can adjust watering schedules based on weather forecasts and soil moisture levels to conserve water.			

Appendices- III

Script of the Audio-Visual Aid

Content used for making Audio Visual aid (documentary)

Creating a video on smart home technology with a maximum length of 5 minutes can effectively deliver a concise yet comprehensive overview. Here's a script and structure you can use to either create or guide your video production:

Video Title: Smart Home Technology: A 5-Minute Overview

Introduction

Welcome to our quick guide on smart home technology! In this video, we'll explore how technology is revolutionizing our living spaces, making homes smarter, safer, and more efficient."

What is a Smart Homes Technology?

"A smart home uses internet-connected devices to enable remote management of various systems and appliances, from lighting to security, making daily tasks more convenient and homes more energy-efficient."

Key Components of Smart Homes

1) Smart Thermostat: Video of a homeowner adjusting the temperature remotely via smartphone.
2) Smart Lighting: Lights automatically adjusting based on voice command.
3) Smart Lock: Footage of someone unlocking their door via a mobile app.
4) Smart Security Camera: Alerts on a phone when motion is detected.
5) Smart Speaker/Assistant: A voice command interaction with Alexa or Google Assistant.

Smart homes are built around several key technologies:

1) Smart Thermostats help regulate temperature, learning your preferences to save energy.

2) Smart Lighting allows you to control lights from anywhere, saving energy and adding convenience.

3) Smart Locks offer keyless entry, increasing both security and ease of access.

4) Security Cameras enable real-time surveillance and instant alerts on your smartphone.

5) Home Assistants, like Amazon Echo or Google Home, integrate all your devices and allow voice control of your entire home."

How Smart Homes Work

Smart home devices communicate with each other via the Internet of Things (IoT). These devices use Wi-Fi, Bluetooth, or Zigbee to connect to a central hub, like a smartphone app or voice assistant, which manages all devices from a single platform. This allows you to control your home remotely, whether you're on the couch or halfway around the world.

Benefits of Smart Homes

1. Convenience: Automate everyday tasks and control them remotely.
2. Energy Efficiency: Reduce your energy consumption with smart thermostats and lights.
3. Security: Monitor your home in real-time, receive instant alerts, and control locks or cameras from anywhere.
4. Personalization: Tailor your home environment to your preferences, from lighting scenes to temperature settings."

Security Concerns & Solutions

1. With great convenience comes potential risks. Cybersecurity is a concern for smart homes, as connected devices can be vulnerable to hacking. To protect your smart home:

    1) Use strong, unique passwords for devices.

    2) Regularly update your devices to patch vulnerabilities.

    3) Ensure your home network is secured with encryption."

Future of Smart Homes

1. Artificial Intelligence enabling predictive and adaptive home automation.
2. Sustainability features, such as smart energy grids and water management systems.
3. Health monitoring devices integrated into your home, offering enhanced care for seniors and individuals with medical needs."

Conclusion

Smart home technology is transforming how we live, offering greater convenience, efficiency, and security. As these technologies evolve, our homes will become even more interconnected, smarter, and responsive to our needs. Thanks for watching

Appendices- IV

Link For the Audio-Visual aid:

https://www.youtube.com/watch?v=gVuDlCkXGgI

Appendices- V

Informed Consent form

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Estd. 1949
NAAC Accredited 'A+' Grade

DEPARTMENT OF FAMILY AND COMMUNITY RESOURCE MANAGEMENT
FACULTY OF FAMILY & COMMUNITY SCIENCES
THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA
VADODARA

INFORMED CONSENT FORM

Dear Respondent,

The Department of Family and Community Resource Management at the Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda, Vadodara, is committed to ensuring the protection of human participants involved in research. I am Tasneem Kapasi, a Senior M.Sc. student in this department. As a part of the partial fulfilment of my master's degree, I am conducting a research on **"Efficacy of developed Audio-Visual aid on Smart Homes Technology among Working Women."**

The objectives of the study are:

1. To study knowledge regarding Smart Homes Technology among working women.
2. To develop an Audio-Visual aid on Smart Homes Technology.
3. To assess the Efficacy of developed Audio-Visual aid on Smart Homes Technology among working women through comparative analysis.

This document provides details about the research, allowing you to make an informed decision about participating. If you agree to participate, you will be asked to complete a questionnaire and provide basic background information, such as your name, age, educational qualification, etc. Please note that your participation in this study is entirely voluntary. Every effort will be made to protect your identity and keep your information confidential. Only the researcher will have access to your responses. Your personal information will only be used to contact you, and your name will not be associated with any research findings. If, at any point during the study, you feel uncomfortable, you may withdraw from the study immediately without any consequences.

If you have any further queries concerning this study, please feel free to contact me via:
Phone: 8758237653
Email: taskapasi343@gmail.com

To participate, please place a (✓) tick mark on "I Agree" to complete the feedback form for the research study.
Your participation will be greatly appreciated.

☑ I AGREE
☐ I DISAGREE

Ms. Salsina Banduk. Salsina

Participant's Name & Signature: **Date:**

Research Scholar
Ms. Tasneem Kapasi
M.Sc. Student
FCRM Department
FFCSc., MSU

Research Guide
Dr. Neha Rathore
Assistant Professor
FCRM Department
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Ms. Aliefiah Khambaty

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Dr. Neha Rathore
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Mrs. Nafisa Kapasi

Participant's Name & Signature: **Date:**

Research Scholar
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Mrs. Meena Rajput

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Research Scholar
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Mrs. Kajal Jadhav Jadhav

Participant's Name & Signature: **Date:**

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Research Guide
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ABSTRACT

ABSTRACT

Technology plays a crucial role in modern households, enhancing convenience, security, and efficiency. Smart home technology, driven by the Internet of Things (IoT), allows centralized control of appliances, energy management, and automation of household tasks. Effective adoption of smart home systems can improve the quality of life, especially for working women, by optimizing time management and reducing daily workload. With increasing digitalization in India, women are actively engaging in both professional and domestic responsibilities, making technological literacy essential. The present study focuses to ascertain the Extent of Knowledge regarding Smart Homes Technology among working women of selected cities such as Vadodara, Ahmedabad and Surat of Gujarat, to develop of an Audio-visual aid for imparting knowledge regarding Smart Homes Technology. The descriptive research design was adopted for the present research. Purposive snowball sampling technique was used for selection of the sample for data the collection from 150 working women who were located in Vadodara, Ahmedabad and Surat cities of Gujarat. The primary data collected through questionnaire tool which comprised of three sections; Background information, Knowledge regarding smart homes technology before the circulation of Audio-Visual aid and Knowledge regarding smart homes technology after the circulation of Audio-Visual aid.

The findings divulged that majority of the respondents belonged to the age group of 32-38 years and 33.31 was the mean of Age of the respondents. 44.66 per cent of the respondents were living in Ahmedabad. 45.33 per cent of the respondents were Graduate. The majority of the respondents were working in Private Sector with 64.67 per cent. 50.66 per cent of the respondents had Monthly Income of ₹10,000 – ₹30,000 rupees with the mean of 39285 and Standard Deviation of 36558.41. The majority Marital Status were Married which were 74 per cent. The Type of Family the respondents had were Nuclear with 66 per cent. Total number of family members were 4-7 with 60 per cent. Number of earning members in the family are 1-3 with 92.66 percent. The majority Type of House were apartment with36 per cent. The list of Smart Homes Appliances/ Devices at home were 4-7 with 55.33 per cent and the majority of the respondents owned Google Assistant with 46.67 per cent. The results also revealed that 7.63 per cent of the respondents had knowledge regarding Comfort and Lifestyle of Smart Homes Technology where 10.09 per cent of the respondents got awareness after the Audio-Visual aid was presented. 7.38 per cent of the respondents had knowledge regarding Automation and Control of Smart Homes Technology where 10.28 per cent of the respondents got awareness after the Audio-Visual aid was presented. 3.74 per cent of the respondents had

knowledge regarding Accessibility and Assistive of Smart Homes Technology where 5.03 per cent of the respondents got awareness after the Audio-Visual aid was presented. 5.52 per cent of the respondents had knowledge regarding Internet and connectivity of Smart Homes Technology where 7.56 per cent of the respondents got awareness after the Audio-Visual aid was presented. 6.91 per cent of the respondents had knowledge regarding Smart Homes Components and Technologies of Smart Homes Technology where 10.13 per cent of the respondents got awareness after the Audio-Visual aid was presented. 7.48 per cent of the respondents had knowledge regarding Safety and Security of Smart Homes Technology where 10.13 per cent of the respondents got awareness after the Audio-Visual aid was presented. 5.45 per cent of the respondents had knowledge regarding Smart Appliances of Smart Homes Technology where 7.64 per cent of the respondents got awareness after the Audio-Visual aid was presented. 5.51 per cent of the respondents had knowledge regarding Smart Lighting and Climate Control of Smart Homes Technology where 7.72 per cent of the respondents got awareness after the Audio-Visual aid was presented. 10.99 per cent of the respondents had knowledge regarding Energy efficiency and sustainability of Smart Homes Technology where 15.34 per cent of the respondents got awareness after the Audio-Visual aid was presented. A significant relationship was found between the Extent of Knowledge regarding Smart Homes Technologies. An Audio-Visual aid developed on Smart Homes Technology has marked a positive difference in existing knowledge of the respondents regarding Smart Homes Technology.